February, 1944

THE FOUNDRY

FIFTY-SECOND YEAR

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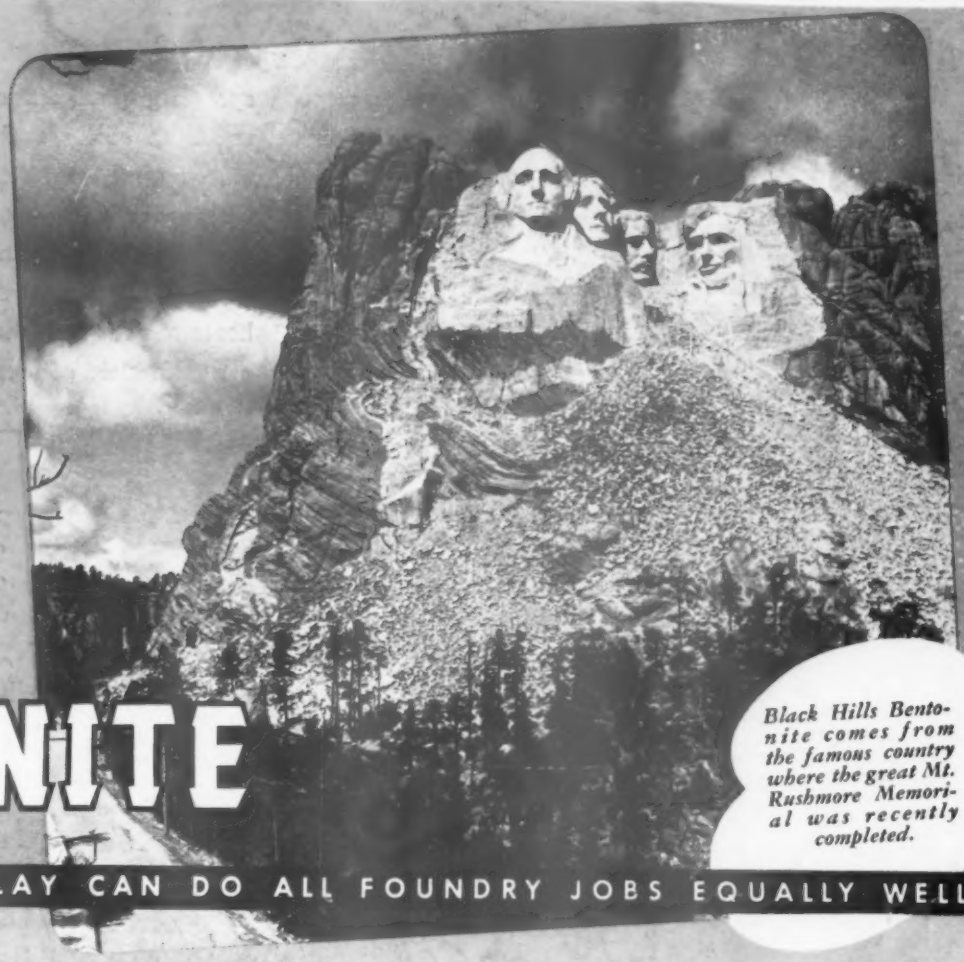
When, and why to use BLACK HILLS BENTONITE



Black Hills Bentonite comes from the famous country where the great Mt. Rushmore Memorial was recently completed.

NO ONE BONDING CLAY CAN DO ALL FOUNDRY JOBS EQUALLY WELL

Mr. Foundryman, the following facts are *well established:*

Black Hills Bentonite has higher dry strength than any other bonding clay. It has higher hot strength than any other clay. It has higher resilience than any other clay. It has no equal in green permeability *combined with* dry and hot strength. Green strength is very high.

You know what these qualities mean to a finished casting. If you want them, choose Black Hills Bentonite. It is a pure colloidal product, extremely strong and dependable, processed in the most modern of plants, kept uniform by close laboratory control.

However, *no one bond clay can do all jobs equally well.* ECP offers you four other clays, each with its own distinct properties. Our engineering staff, drawing upon a wealth of data which is constantly increasing, will be glad to study your needs and recommend the *one right mix* for your purpose.

Representatives
C. Donaldson & Co.
Los Angeles, Calif.
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EASTERN CLAY PRODUCTS, INC., EIFORT, OHIO

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510 United Artists Bldg.

WOLLASTON, MASS.
33 Bass Street

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Box 150

ECP

DIXIE BOND · BLACK HILLS BENTONITE · REVIVO BOND · REVIVO SUPER BOND · BALANCED REVIVO

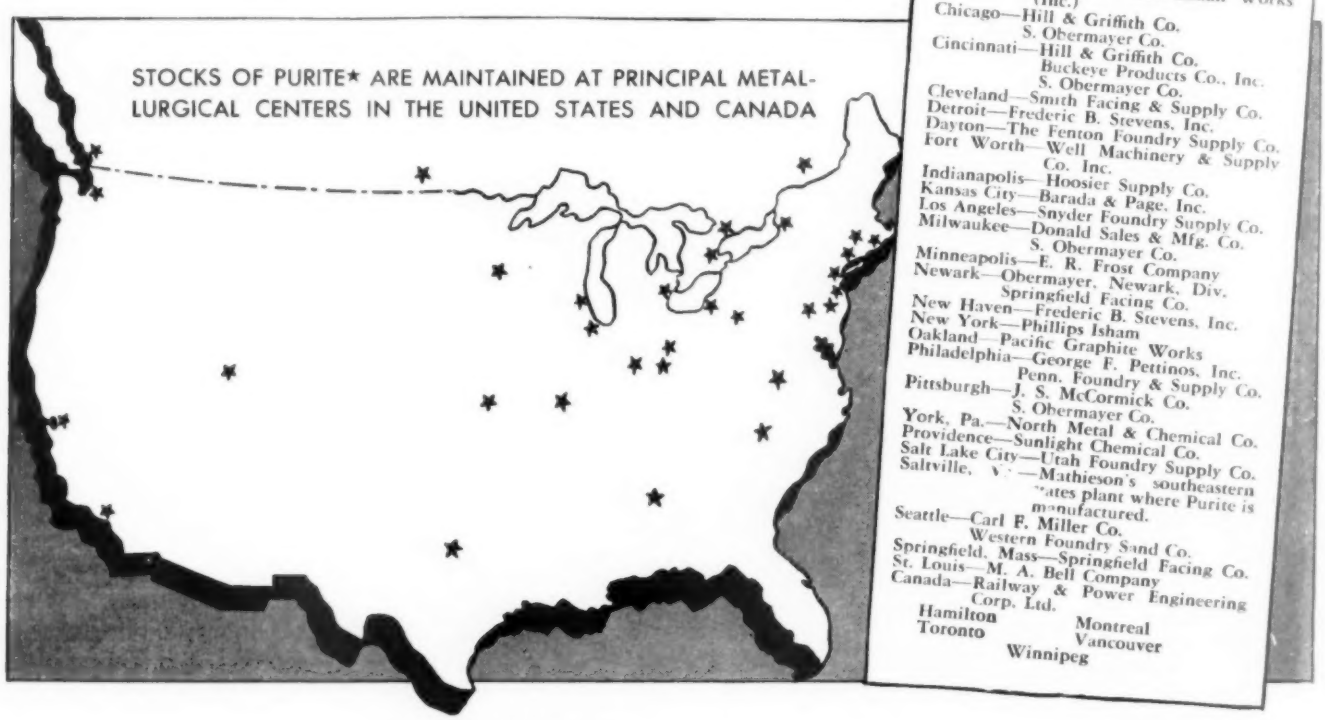
All TYPES OF BONDING CLAYS

A Foundry Sand Service Based Upon Practical Research

THE FOUNDRY INDUSTRY DELIVERS THE GOODS!

TODAY foundrymen are producing high-test castings with all-scrap mixtures which meet the rigors of war in every climate from the South Seas to Siberia. Mathieson takes pride in the part Purite is playing in helping to meet the demand for maximum production of sound, dependable castings. In cupola and mixer ladles in gray iron foundries Purite is reducing rejects and speeding production of high-test castings that machine easily and take a high finish. In converter steel foundries Purite is reducing sulfur from over .10% to under .03% in making castings which withstand the strains of war at 80° below zero. In secondary metal refining and in brass melting, Purite is increasing by several percent the yield of sound ingots and castings.

PURITE—Soda ash in its most efficient form for metallurgical use



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PURITE

THE MATHIESON ALKALI WORKS (INC.)

60 EAST 42ND STREET, NEW YORK, N. Y.

(Licensee of Metallurgical Development Company, Inc.)

FBI PROBES EASTON GAS BLAST
Death Toll Mounts To Three; Damage Exceeds $500,000; Score In Hospital, 75,000 Without Fuel In Affected Area
WAR PLANT BLAST FATAL TO WORKER
6 Others, Including 4 Firemen Injured in Explosion and Blaze in Queens
PAINT UNIT IS WRECKED
EXPLOSION RAZES JERSEY WAR PLANT; 2 DEAD, 6 MISSING
At Least 9 Others Hurt in Blast That Rocks Building
WIDE AREA FEELS

Fire! Explosion! Disaster!

Suddenly the peaceful busy hum of an ordinary working day, or night is shattered.

The air is rent by detonations; roofs and walls crash inward; the screams of the injured crying for aid.

Is your plant prepared for such a crisis?

In many a disaster, it is not the first blast which takes the major toll of lives and property, but the aftermath of flood, escaping gases, and fire—which can be prevented.

Aroused by the menace of air raids, Bethlehem Steel stepped up its plant protection system to meet every kind of crisis. Recently its plants at Bethlehem, Pa., and Seattle, Wash., were cited by the Office of Civilian Defense, for the completeness and efficiency of the system. This protection plan has been filmed in a 40-minute motion picture:

"IF IT HAPPENED HERE"

A Film on Industrial Air Raid Protection

Whatever may be the current danger from air raids, no one can be sure of immunity from unforeseen catastrophe. Sabotage is a threat as long as war continues; fires and explosions can happen even in peacetime.

FREE FOR ANY WAR PLANT

The protective organization pictured in this film can be adapted to any large plant or shipyard. Extra prints of the films have been made, and will be loaned without charge to any company engaged in war work. Apply, Motion Picture Bureau, Publications Department, Bethlehem Steel Company, Bethlehem, Pa.

ONE PROOF OF THE PUDDING

While industrial fires throughout the United States have increased 8.25%, fires in Bethlehem Steel plants, yards and other units, are down 4.68%.

Note: Figures are for first 7 months 1943 compared with same period 1942. Bethlehem fires decreased in spite of larger operations and increased employment roll.

★ BETHLEHEM STEEL ★

WORLD'S LARGEST SHIPBUILDER ★ SECOND LARGEST STEEL PRODUCER

WHAT'S ALL THE SHOUTING ABOUT ?

CROWN HILL

SEACOAL FACING

We've been shouting about Crown Hill Seacoal since last September and

HERE'S WHY — Crown Hill Seacoal is made from a low-sulphur, low-ash coal.

Sulphur content is so low that surface "hard spots" resulting from sulphur pick-up are eliminated when Crown Hill is used.

The low-ash content of Crown Hill means two things (1) less ash residue in the sand and (2) no burn-in on the castings—no fusion of sand to castings because the remaining ash has a fusion point *higher* than molten iron.

We invite you to prove these claims in your own foundry. Try Crown Hill on your next order.

THE FEDERAL FOUNDRY SUPPLY COMPANY

4600 East 71st Street • Cleveland 5, Ohio

Seacoal Plant
CROWN HILL, W. VA. • CHICAGO • CHATTANOOGA, TENN. • DETROIT • MILWAUKEE • MINNEAPOLIS • NEW YORK • ST. LOUIS • RICHMOND, VA. • Mines UPTON, WYO.

THE FOUNDRY

for FEBRUARY 1944

VOLUME 72 NUMBER 2

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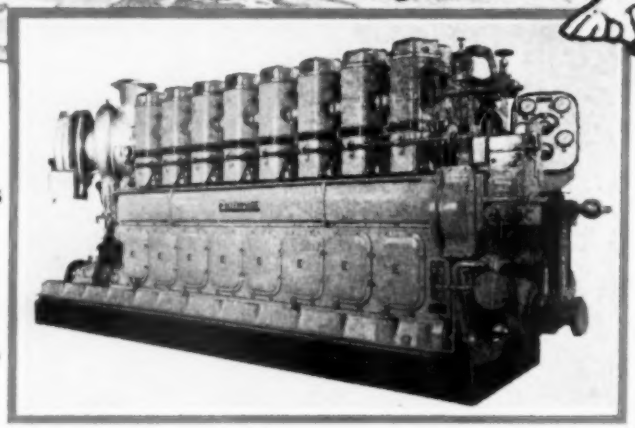
Core Practice Results are

★

Enterprise Diesel Engines power thousands of work boats needed in a world at war.

★



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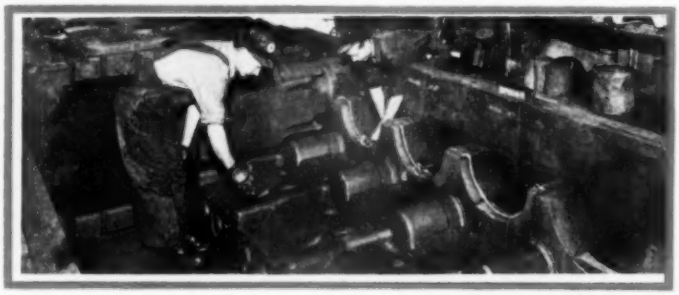
WAR
BONDS



Invest in Victory. A wise and safe investment. One thing we can do and should do. His part to do and die; our part to do and buy. Support the FOURTH WAR BOND DRIVE. Support America at war. Support the boys at the front. Give them PLENTY and IN TIME. Buy more War Bonds today, our safest investment.

THE WERNER G.

(DIVISION OF ARCHER-

2191 WEST 110 STREET WOODBINE

Simplified Gratifying

says

HENRY R. PENNING
GENERAL SUPERINTENDENT
Richmond Plant

LINOIL

The two large plants of Enterprise Engine and Foundry Company, one at South San Francisco and one at Richmond are devoted almost exclusively to the production of castings for Diesel engines. Both plants are enthusiastic users and endorsers of Linoil. Pictures taken at Richmond.

"Our core practice is simplified since we have been using Linoil and results have been very gratifying." There in a nutshell is the experience of hundreds of foundrymen with Linoil in all parts of the country. Obviously a highly technical material like core oil must have something on the ball to rank as leader in such a field. It pays to give your molders cores of absolute dependability, cores that generate a minimum of gas, cores that stand the heat, friction and weight of flowing metal and yet are entirely collapsible against the shrinking of the cooling casting. Linoil is a pleasure to use and an economy to buy.

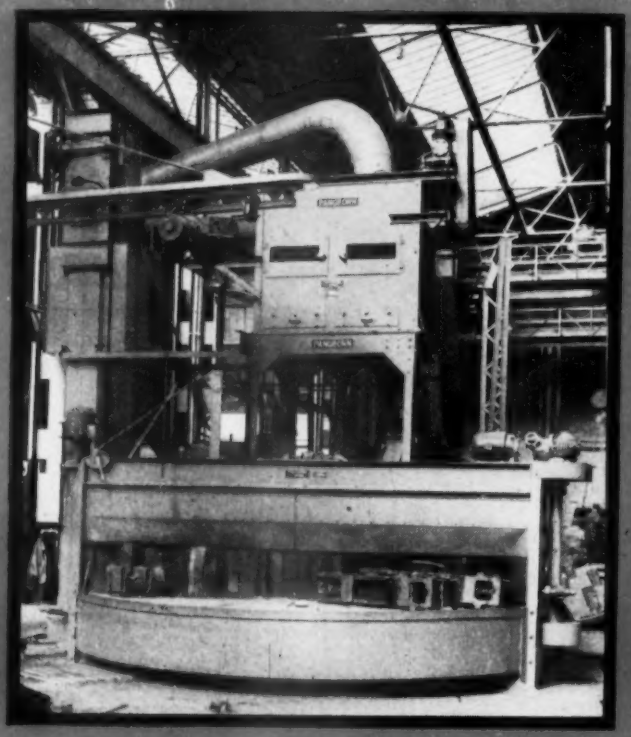
SMITH COMPANY

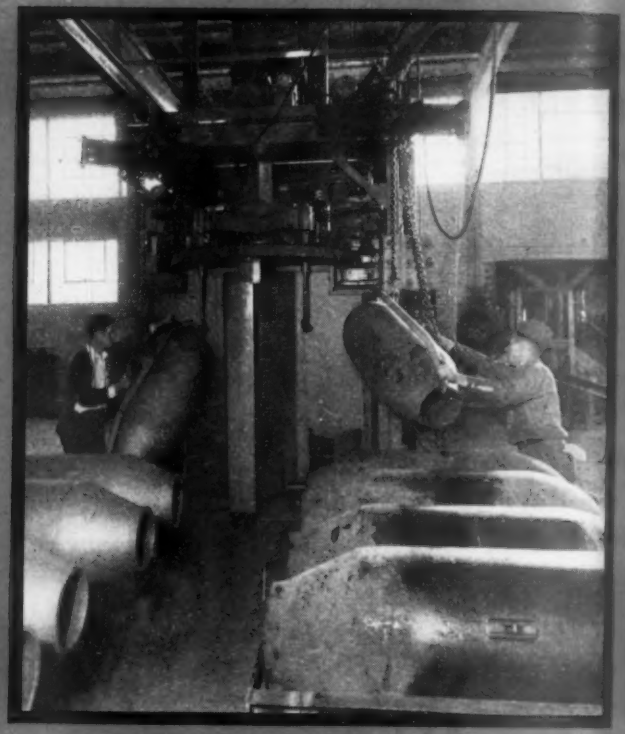
DANIELS - MIDLAND COMPANY)

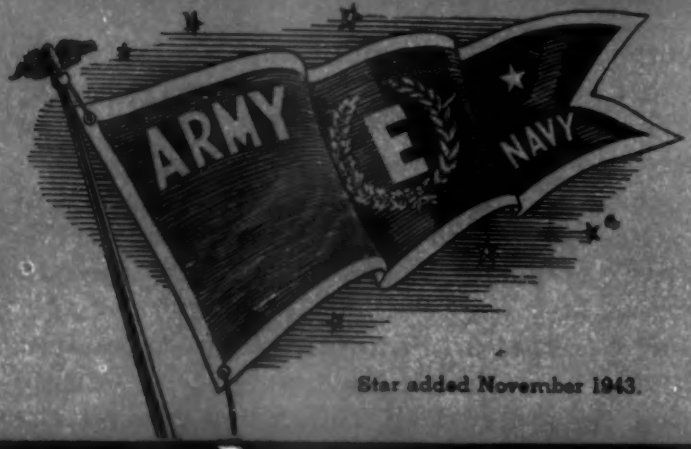
4690 CLEVELAND 2, OHIO

INTIMATE

WITH FOUNDRY BLAST







Star added November 1943.

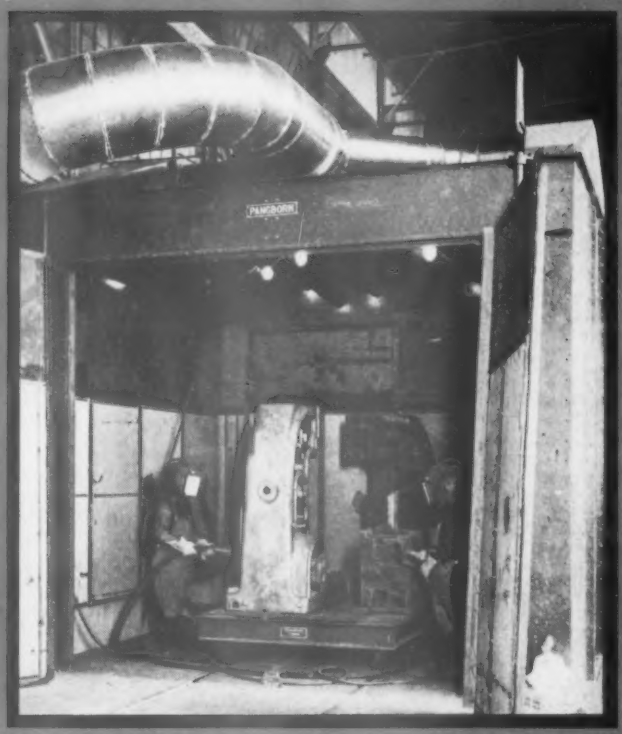
40 years continuous service --growing with the foundry and metal processing industries --has brought Pangborn engineers into intimate contact with almost every possible blast cleaning and dust control problem. To this rich background of experience is

WORLD'S LARGEST MANUFACTURER OF BLAST

PANG

PANGBORN CORPORATION . . . . . .

CONTACT
CLEANING PROBLEMS



added more than two years of successful designing, building and erecting of specialized war plant installations -- both ROTO-BLAST and Air Blast. The Army-Navy "E" award with added star, proves the value of this equipment in the vital war effort.

Qualified beyond question to recommend only the most efficient equipment -- Pangborn asks specifically for an opportunity to work with you -- at once -- on any war or post war blast cleaning or dust control program you now visualize. "Come to Pangborn".

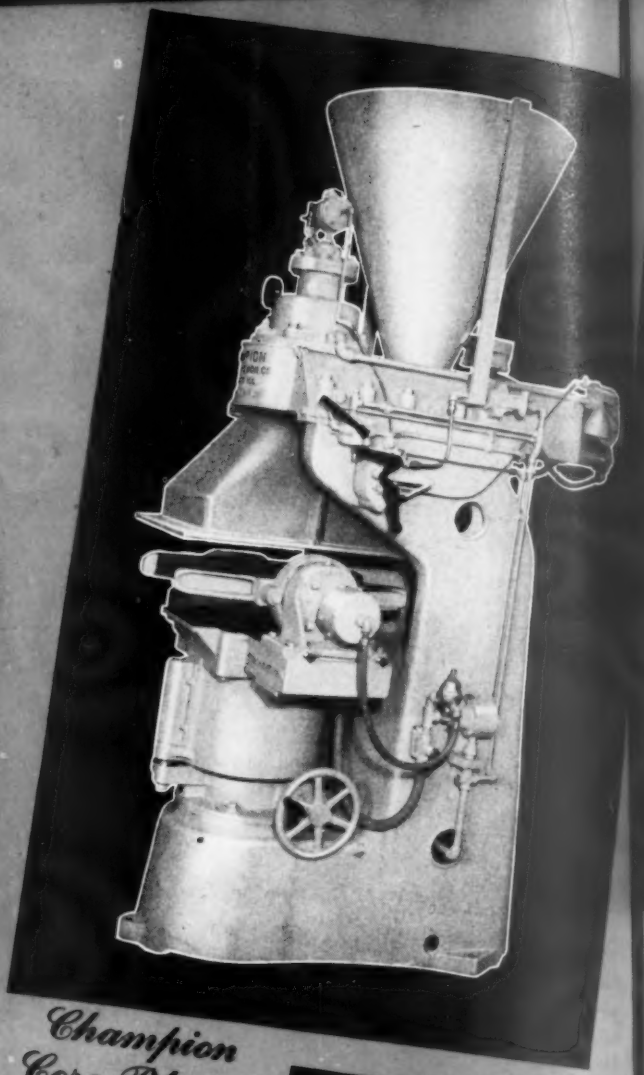
CLEANING AND DUST CONTROL EQUIPMENT

BORN

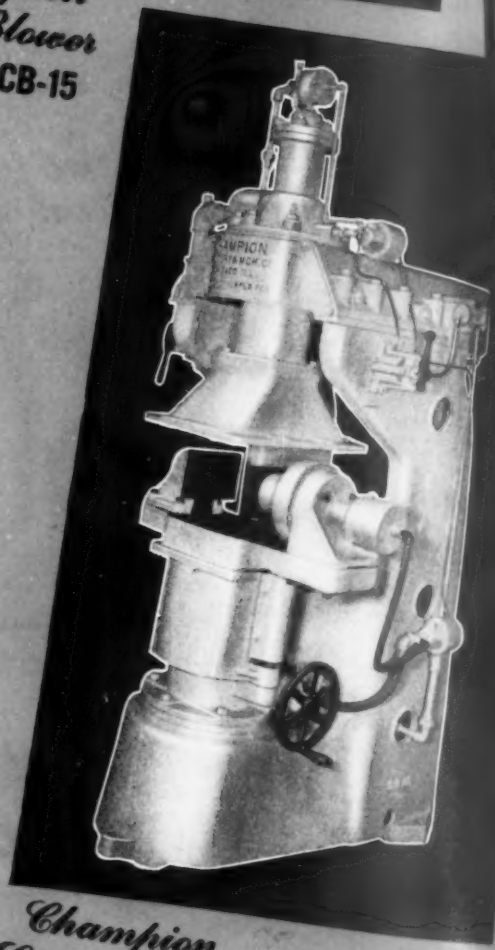
HAGERSTOWN, MARYLAND

Champion

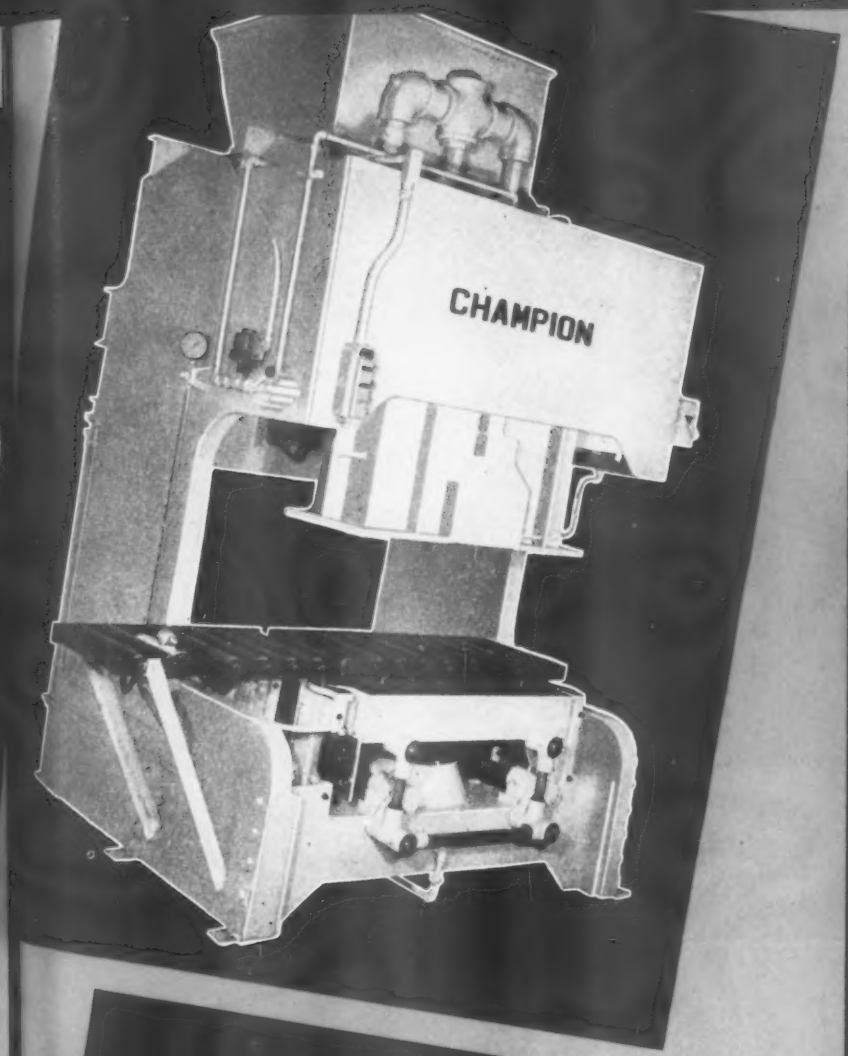
Core Blowers May Be the Answer to Your Man-Power Problem



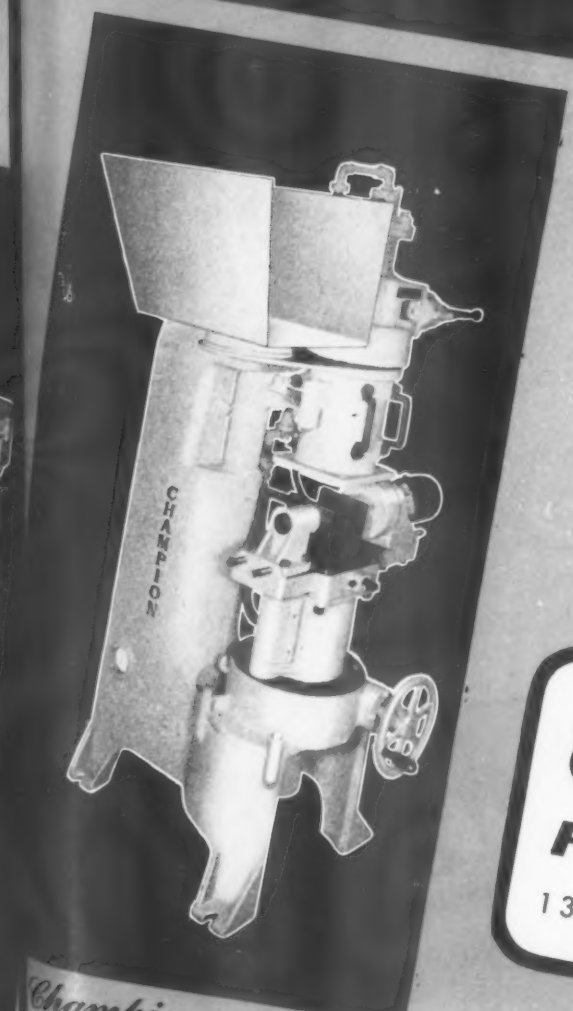
Champion Core Blower **MODEL CB-15**



Champion Core Blower **MODEL CB-12**



Champion
Core Blower
MODEL CB-400



Champion
Core Blower MODEL CB-8

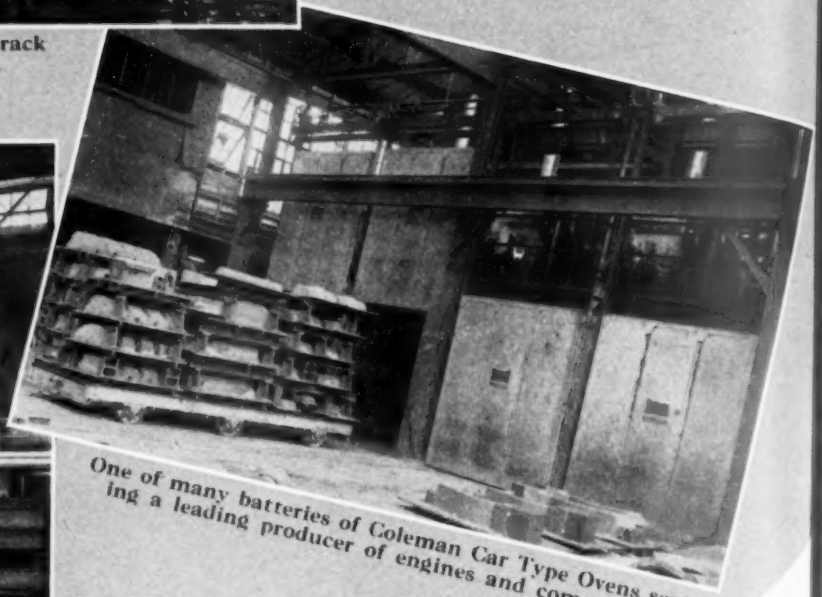
Champion Core Blowers have designed yesterday's experience into today's requirements. Any man, woman or child can economically produce perfectly rammed cores with these modern machines. The operator merely sets the box, pulls the lever and the core is perfectly rammed. Regardless of core size—small or large—the ramming time is identical. Every core rammed by a *Champion* is uniformly accurate. A single valve operates the core box clamp, clamps same against the blow plate, blows the core, exhausts and releases the clamps in the proper cycle. A *Champion* is always the best bet when *impossible* production schedules must be faced.

CHAMPION
FOUNDRY & MACHINE CO.
1318 W. 21ST STREET, CHICAGO

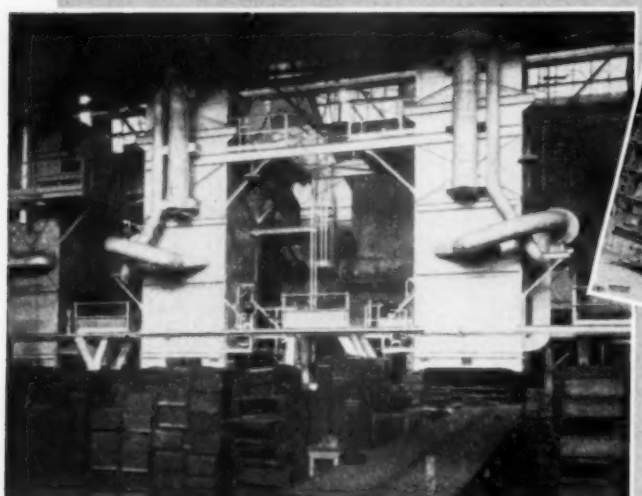
COLEMAN OVENS

Part of large installation of Coleman Transrack Ovens in leading magnesium foundry.

famous for
FAST, PERFECT
baking



One of many batteries of Coleman Car Type Ovens serving a leading producer of engines and compressors.



Coleman Tower Core Ovens. One of many batteries installed for a leading producer of malleable castings.

COLEMAN CORE AND MOLD OVENS

THE FOUNDRY EQ
BUILDERS OF COLEMAN ND
CLEVELAND, OHI

Vitally Essential!

SAVE MAN-POWER — SPEED PRODUCTION — SOLVE FUEL PROBLEM

PROFIT by the "know-how" gained through nearly 40 years of specialization in the construction of more than 8,000 successful foundry oven installations of all types and sizes for a great variety of foundry work—GET FASTER, BETTER, LOWER COST PRODUCTION WITH COLEMAN OVENS.

Good castings demand good cores! Coleman Ovens provide a dependable production of perfectly baked cores at lowest possible cost for fuel and labor. The repeated selection by leading foundries in all classes of foundry production is proof of the outstanding performance and economy of Coleman Ovens.

Coleman Ovens will help solve your oven fuel problem. All sizes and capacities are built for whatever fuel is most easily and economically obtainable in your district—gas, oil, coke, stoker coal, etc.

Coleman Horizontal Conveyor Core Oven in a leading production foundry.

Nearly every foundry has its own special operating problems. A Coleman Engineer will gladly survey your conditions and recommend the right type or types of Coleman Ovens to best meet your particular needs. No obligation!

. . .

Coleman Ovens are built in a wide range of sizes in following types—

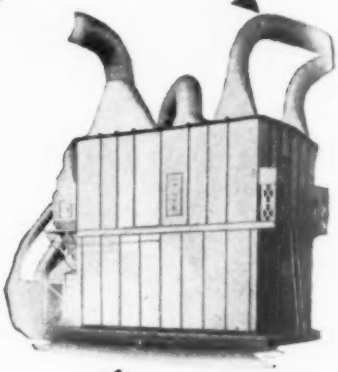
- **COLEMAN Portable Ovens**
- **COLEMAN Rolling Drawer Ovens**
- **COLEMAN Transrack Ovens**
- **COLEMAN Car Type Ovens**
- **COLEMAN Tower Ovens**
- **COLEMAN Horiz. Conv. Ovens**

Write for Folio of Bulletins

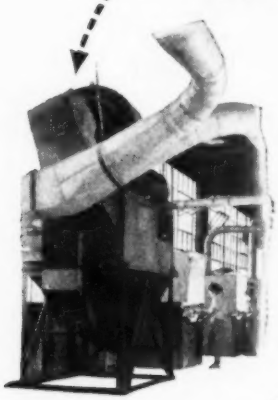
Y EQUIPMENT CO.
IAN ND SWARTWOUT OVENS
ND, OHIO, U.S.A.

COLEMAN CORE AND MOLD OVENS

DUST *and* FUME CONTROL *is a job for...* ENGINEERING *Specialists*



Clean dry returnable air required; cloth filter selected.



Wet process air cleaning using ROTOCLONE

Centrifugal separator suitable for heavy dust concentration

Combination of centrifugal separator and dry filter.

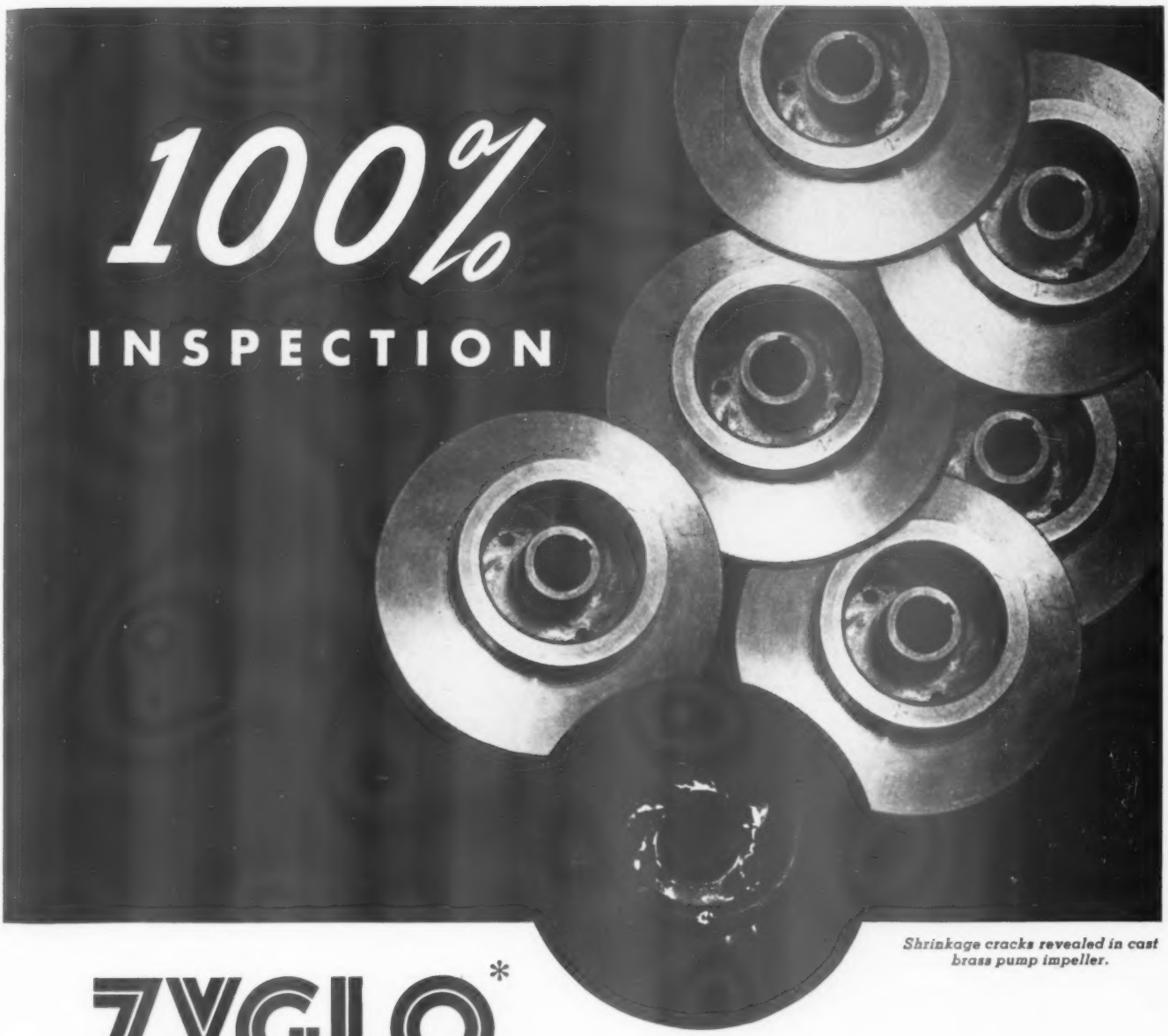
Each unit in a dust or fume control system must be the *right* unit for the particular kind and condition of dust and air present. Selection of the correct, most efficient units—wet, dry, or centrifugal— from the various makes available, is too important for mere hit-or-miss judgment. Like any other complex mechanical project, the planning of a really efficient dust and fume control system is decidedly a job for *engineering specialists.*

For over 36 years, the Kirk & Blum Engineering Staff has specialized in this particular field. First, our Staff makes a thorough analysis of your special dust or fume control problem. Next, the right units for your job are selected from among the various makes available. Finally, our Staff *designs* and *installs* a complete system that is *guaranteed* by Kirk & Blum to give the results you want.

Don't risk serious loss of time and money. Don't let guesswork leave you "stuck" with units that are not right for your particular job. Get the unbiased counsel and planning of experts—Kirk & Blum Engineers. For details write THE KIRK & BLUM MANUFACTURING CO., **2808** Spring Grove Avenue, Cincinnati, Ohio.

Other equipment designed and installed by Kirk & Blum . . .
"Cooling Systems for the Glass Industry"
"Industrial Ovens"

KIRK AND BLUM
AN ORGANIZATION OF ENGINEERS AND MECHANICS



Shrinkage cracks revealed in cast brass pump impeller.

ZYGLO*

BLACK LIGHT METHOD Permits Pre-Inspection for Flaws of Every Part in Production

Methods of parts inspection by "sampling" or inspecting random specimens cannot be expected to assure 100% flaw-free finished assembled products. Conversely it *can* be expected that 100% inspection—examining every part produced—will assure results closest to that ideal.

Zyglo allows 100% inspection in fields where it was not before possible or economical. Any solid material whether metal, glass, ceramic or plastic can be inspected.

Zyglo's brilliant fluorescent indications enable the rejection of parts susceptible to failure and also focus attention on the correction of production operations which cause the flaws.

Let us make an actual demonstration inspection of your product.

• • •

**ZYGLO—The Trade Mark of Magnaflux Corporation applied to its equipment, material and methods for fluorescent penetrant inspection.*

MAGNAFLUX CORPORATION

5918 Northwest Highway, Chicago

NEW YORK • DETROIT • CLEVELAND • DALLAS • LOS ANGELES

With the addition of electric furnaces, Whiting is now prepared to supply a complete line of melting units for gray iron, malleable, and steel foundries. Whiting recently acquired the Hydro-Arc Furnace Corporation, whose improved designs have opened the way to quicker, lower cost electric melting.

HYDRO-ARC Electric Furnaces

More Accurate Electrode Positioning

through hydraulic power operation. Reduces power and electrode consumption, time lag, over-travel of electrodes, "hunting," power surging, transformer heating, and carbon pick-up.

Power-Operated Electrode Clamps

avoid the most disagreeable and hazardous task connected with electric furnace operation—climbing above the hot furnace to slip and change electrodes.

How these and other Hydro-Arc features speed melting time and permit more heats per day is described in our literature—write today.

SIDE-BLOW CONVERTERS produce steel of proven quality. Scores of these units have gone into service during the present war.

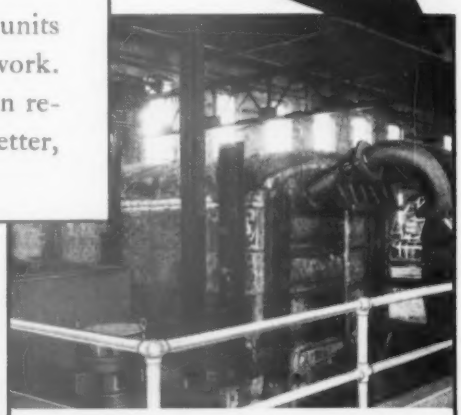
ROTARY FURNACES for malleable iron, high test grey iron, and other specialized melting operations.

MELTING EQUIPMENT

Each of these Whiting melting units is outstanding for a special class of work. Descriptive literature is available on request. Let Whiting assist you to better, more economical melting.

WHITING CUPOLAS are now melting more than 90% of the grey iron castings produced in the United States.

CRADLE FURNACES provide a constant supply of homogenous super-heated metal. Fired with pulverized coal.



AIR FURNACES, pulverized coal fired, are used extensively in malleable and roll foundries, saving fuel, time, and labor.

WHITING DUPLEXING combines the advantages of cupola and air furnace. Many other duplexing combinations are also in use.

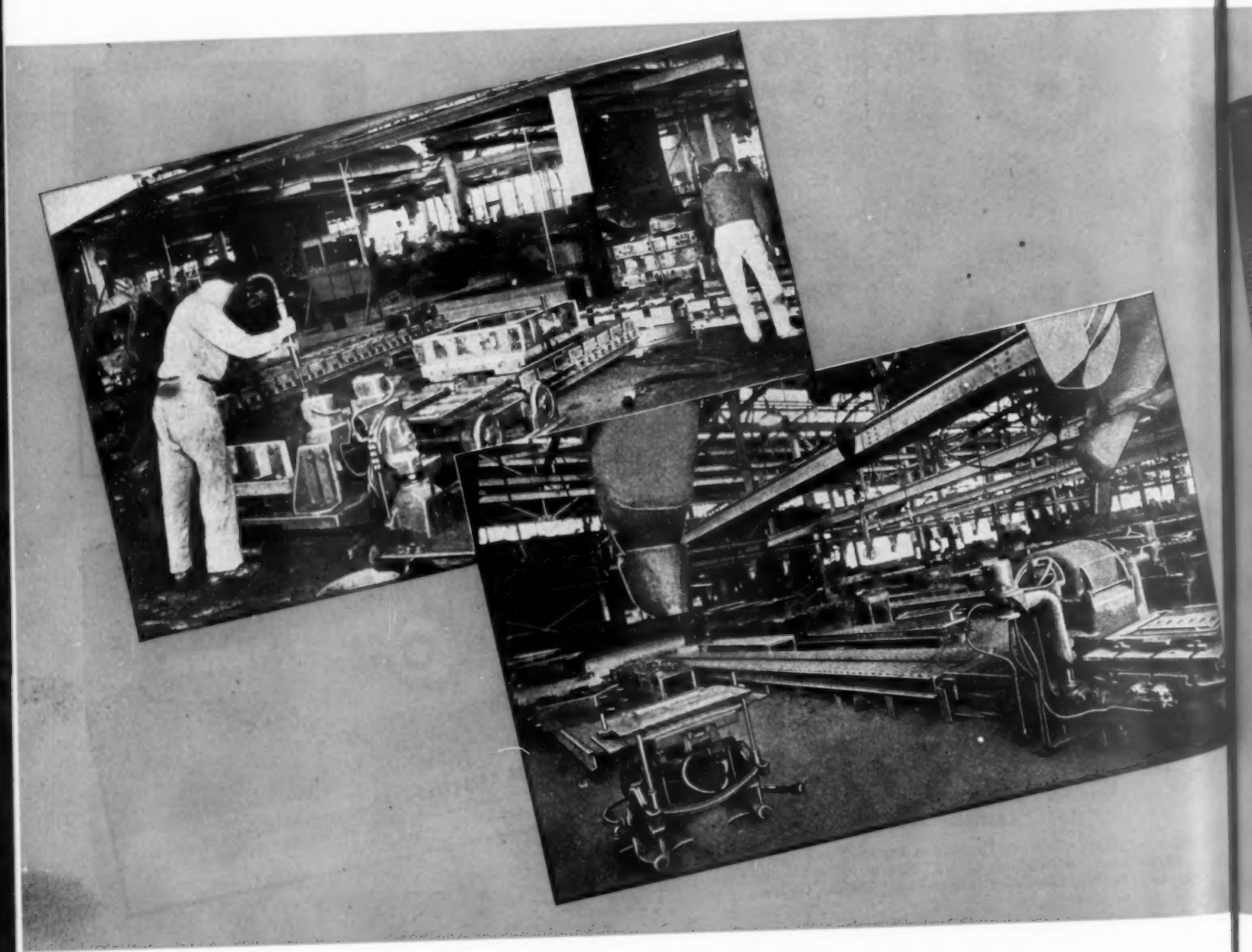
ARMY NAVY

WHITING CORPORATION

15607 LATHROP AVENUE, HARVEY, ILLINOIS

Offices in Chicago, Cincinnati, Detroit, Los Angeles, New York, Philadelphia, Pittsburgh, St. Louis, and Washington, D. C. Agents in other principal cities. Canadian Subsidiary: Whiting Corporation (Canada) Ltd., Toronto, Ontario.

Long war - short war!



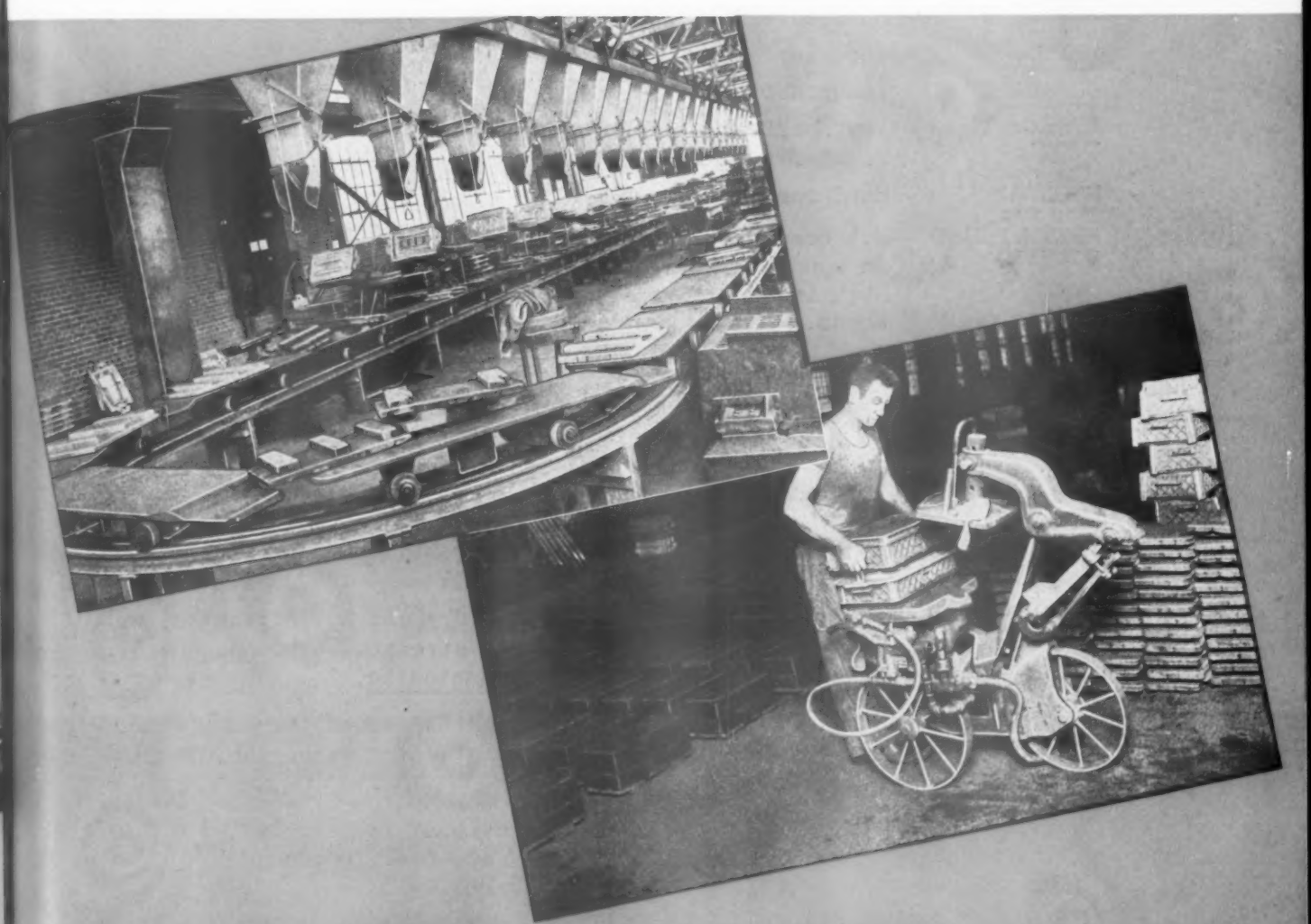
WHETHER the war ends this year or a long time from now . . . whether good times follow the peace, or slow times—the foundry that can produce a better product at a lower cost will be in the best position to take advantage of *any* situation.

For 50 years Osborn has helped leading American Foundries be the low-cost foundries —by developing new and better moulding and core making machines which, step by step, have built up foundry practice to its present high productive level and economical operation.

Osborn Moulding Specialists are now serving as consultants to leading foundries on reconversion to meet postwar needs. Whether you need new machinery now or not—*now* is the time to plan for the future . . . to be ready for *whatever* it brings. This service is yours without obligation.

THE OSBORN MANUFACTURING COMPANY

5401 Hamilton Avenue *Cleveland, Ohio*



OSBORN

MOULDING MACHINES

VOLCLAY BENTONITE

NEWS LETTER No. 4

REPORTING NEWS AND DEVELOPMENTS IN THE FOUNDRY USE OF BENTONITE

CRACKED CASTINGS

This defect, common to the foundry, is caused by the following reasons:

(a) Due to internal stresses set up in the casting while cooling.

DESIGN – Casting poorly designed, promoting wide variations in cooling rates of the different section thicknesses.

GATING – Improperly gated.

CORES – Hard cores.

METAL – Incorrect metal composition.

POURING – Incorrect shake-out time.

OTHER – Improperly heated. Rates of heating or cooling too rapid for design.

MOLDING – Hard rammed molds.

MOLDING SAND – Hot compression strength too high. Usually too high in bond and moisture content. Too many fines in sand. High iron content of heap. Wrong combination of clay bonds.

(b) Caused by action of external stresses.

OTHER – Rough handling.

Cracked Castings are often due to a combination of several of the above reasons, but the most frequent cause is improper molding sand.

It is essential to have low dry and hot compression strengths in the facing sand.

Since fireclay and Western bentonite develop high dry and hot strengths, we must use a bond that will give us low dry and hot strengths. This can be accomplished by using Panther Creek, a Southern Bentonite.

To insure proper green strength less Panther Creek is needed than any other bond, yet it possesses the lowest dry and hot compression strengths. Therefore, it minimizes cracks.

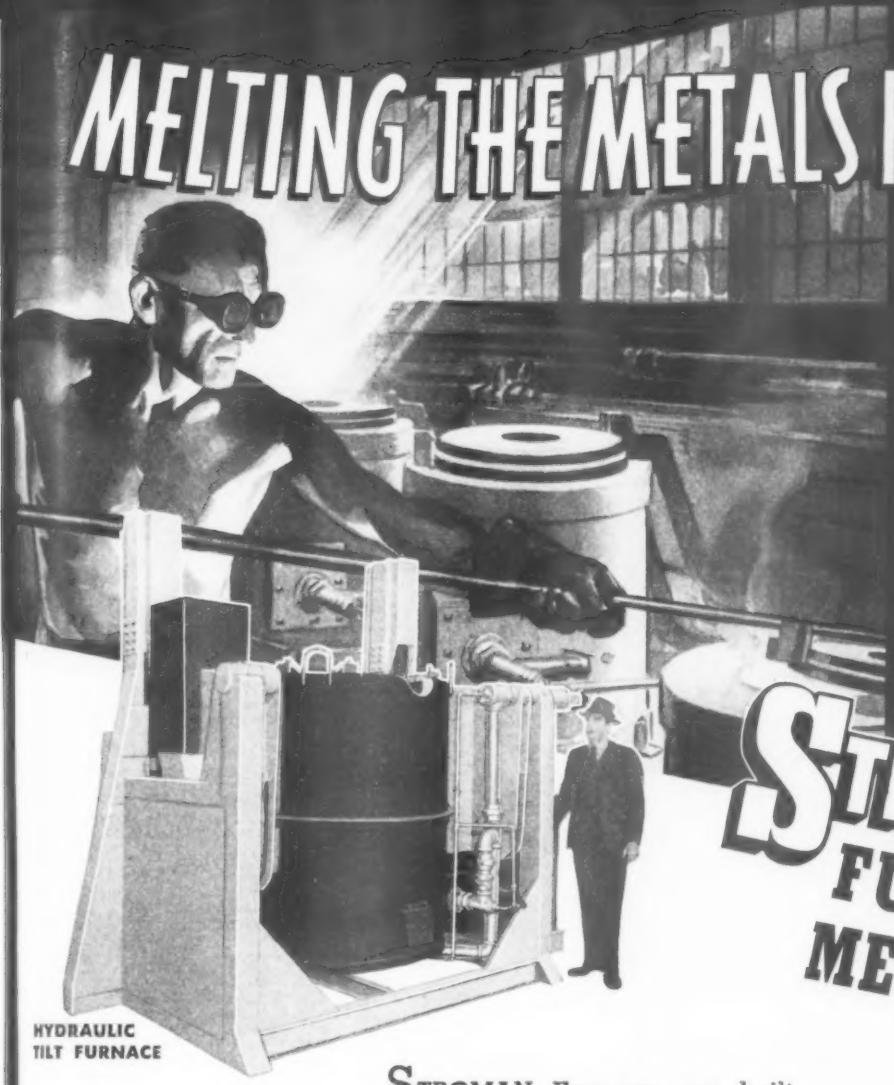
Write for our PANTHER CREEK BOOKLET describing in detail the advantage of this bentonite bonding material, produced by the manufacturers of VOLCLAY WESTERN BENTONITE.

AMERICAN COLLOID COMPANY

363 WEST SUPERIOR STREET • CHICAGO 10, ILLINOIS

Producers of Volclay and Panther Creek Bentonite

MELTING THE METALS FOR VICTORY!



HYDRAULIC TILT FURNACE

Throughout this great country of ours many foundries geared to 100% war work have discovered that Stroman Melting Furnaces, because of their many exclusive features and streamline design, have helped them speed production, reduce costs, conserve metal, and eliminate costly shut-downs and expensive repairs.

Stroman equipped foundries are meeting vastly increased production schedules with ease. Bronze for bearings . . . Magnesium for motors . . . Aluminum for aircraft . . . and hundreds of other war materials keep pouring from Stroman Furnaces incessantly, supplying the necessary castings, and assuring the Allied Nations of a speedy victory. Stroman Melting Furnaces installed in your foundry will soon convince you of their superiority. Why not write for complete information NOW?

STROMAN FURNACES MELT... BRASS BRONZE ALUMINUM MAGNESIUM and other Non-Ferrous Metals

STROMAN Furnaces are built in sizes to handle any desired capacity. They embody four different designs . . . Hydraulic Tilt . . . Mechanical Tilt . . . Hand Tilt . . . and Stationary. Each type furnace can be constructed to handle the melting of brass, bronze, aluminum, magnesium or other non-ferrous metals.

Stroman Hydraulic Tilt Furnaces possess such features as, The Stationary Lip Pour which allows the ladle to remain in one position during the entire pour . . . Variable Speed Pour gives absolute control over tilting speed.

Other Stroman Furnace types have many of their own distinctive engineering and construction features which make them the easiest and most economical to operate, assuring trouble-free operation. All types may be fired by either gas or oil equally efficient. Literature on Stroman Melting Furnaces is now available. It will be sent you upon request.

HAND TILT FURNACE

STATIONARY SWING COVER FURNACE

Service Note

Bring your problems on metal melting or foundry layout to Stroman. Their engineers are qualified authorities of long standing on these subjects and will gladly analyze your problems and offer many helpful suggestions.

STROMAN FURNACE & ENGINEERING CO.

DIVISION OF

THE PETERSEN OVEN CO. 300 W. ADAMS ST. CHICAGO 6

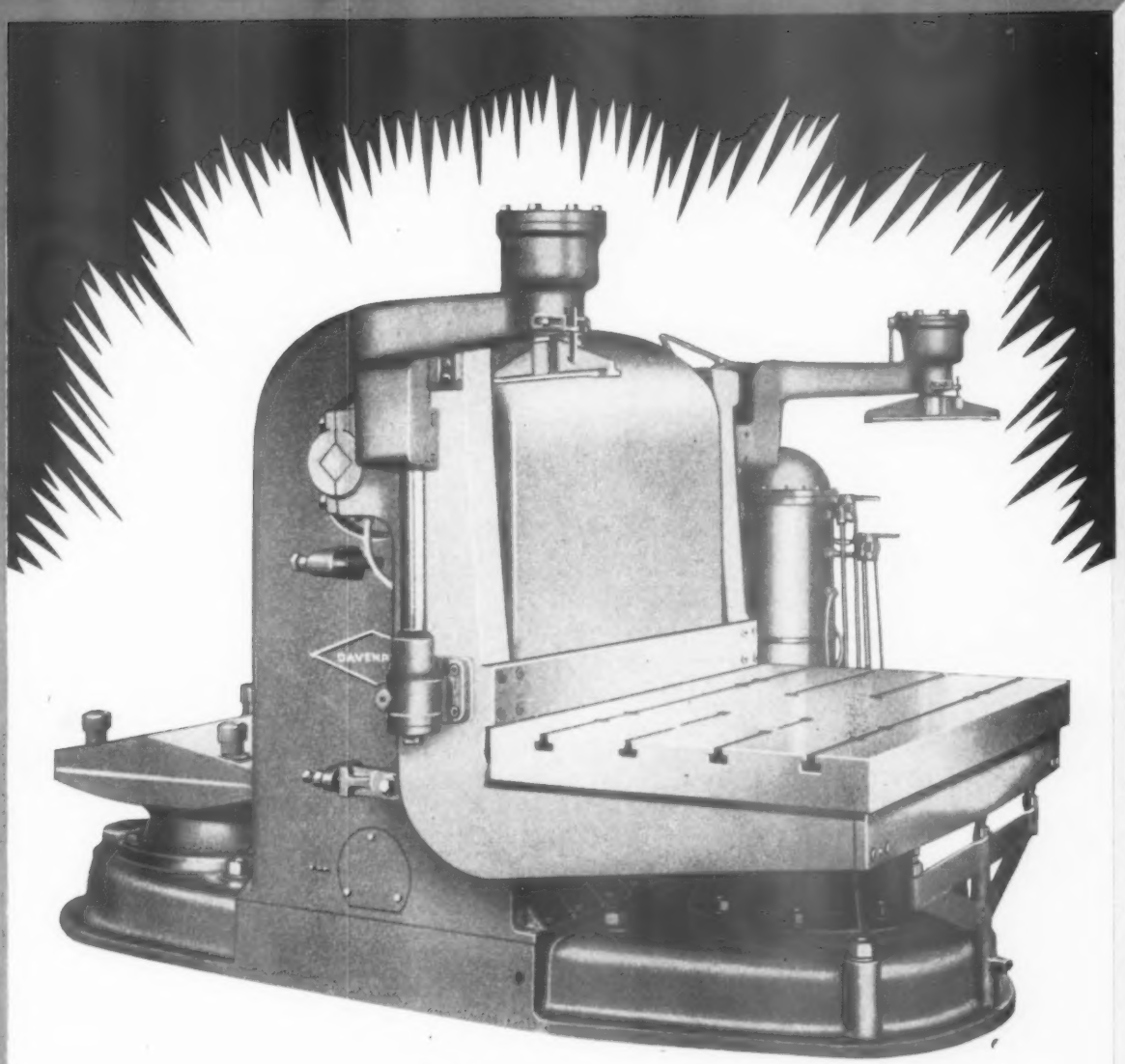
1944

FANNER CHAPLETS

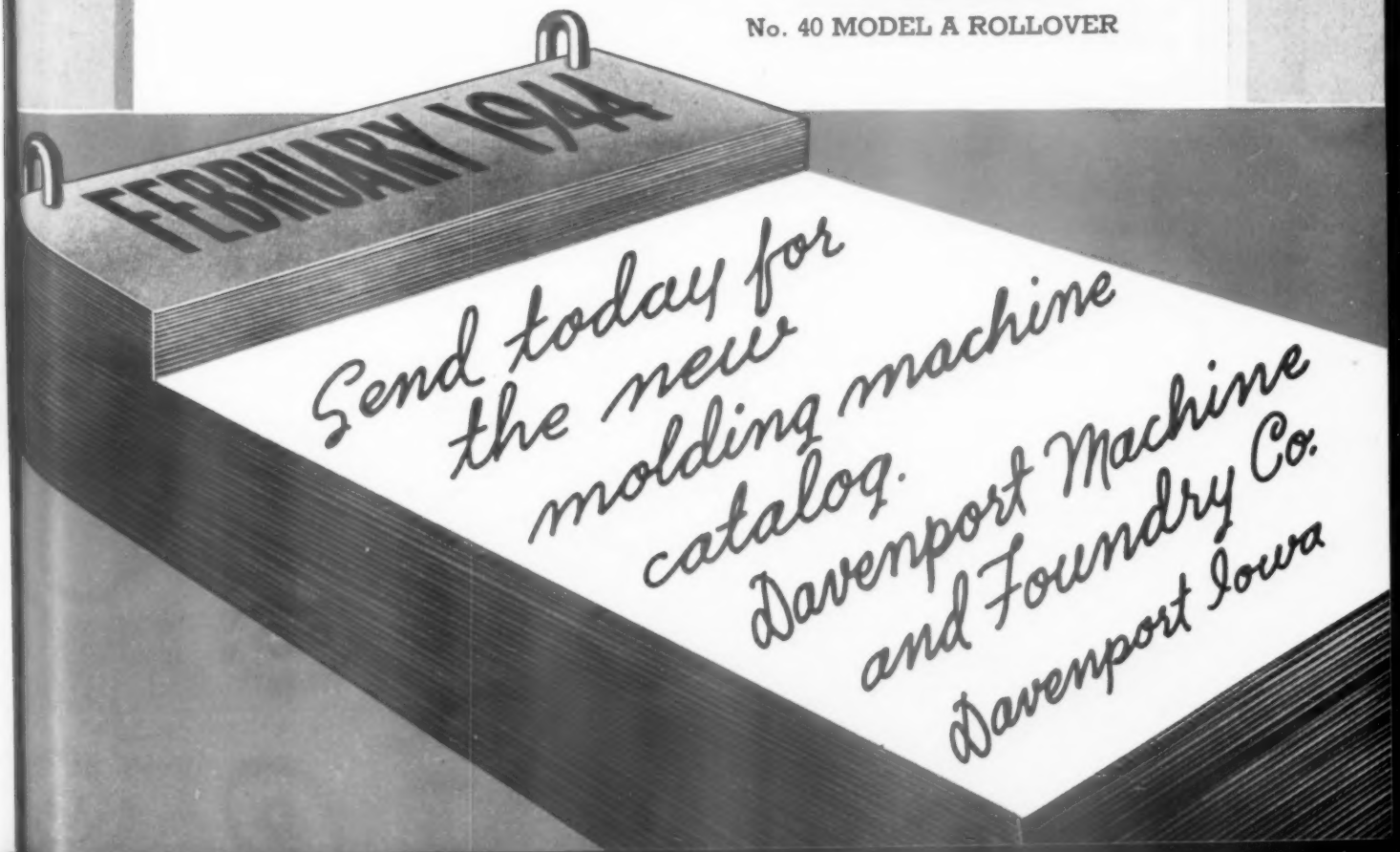
Whatever your CHAPLET requirements may be,
there is a FANNER CHAPLET to fit the job.

THE FANNER MANUFACTURING COMPANY, CLEVELAND, O.

THE CANADIAN FANNER LTD., HAMILTON, ONTARIO, CANADA



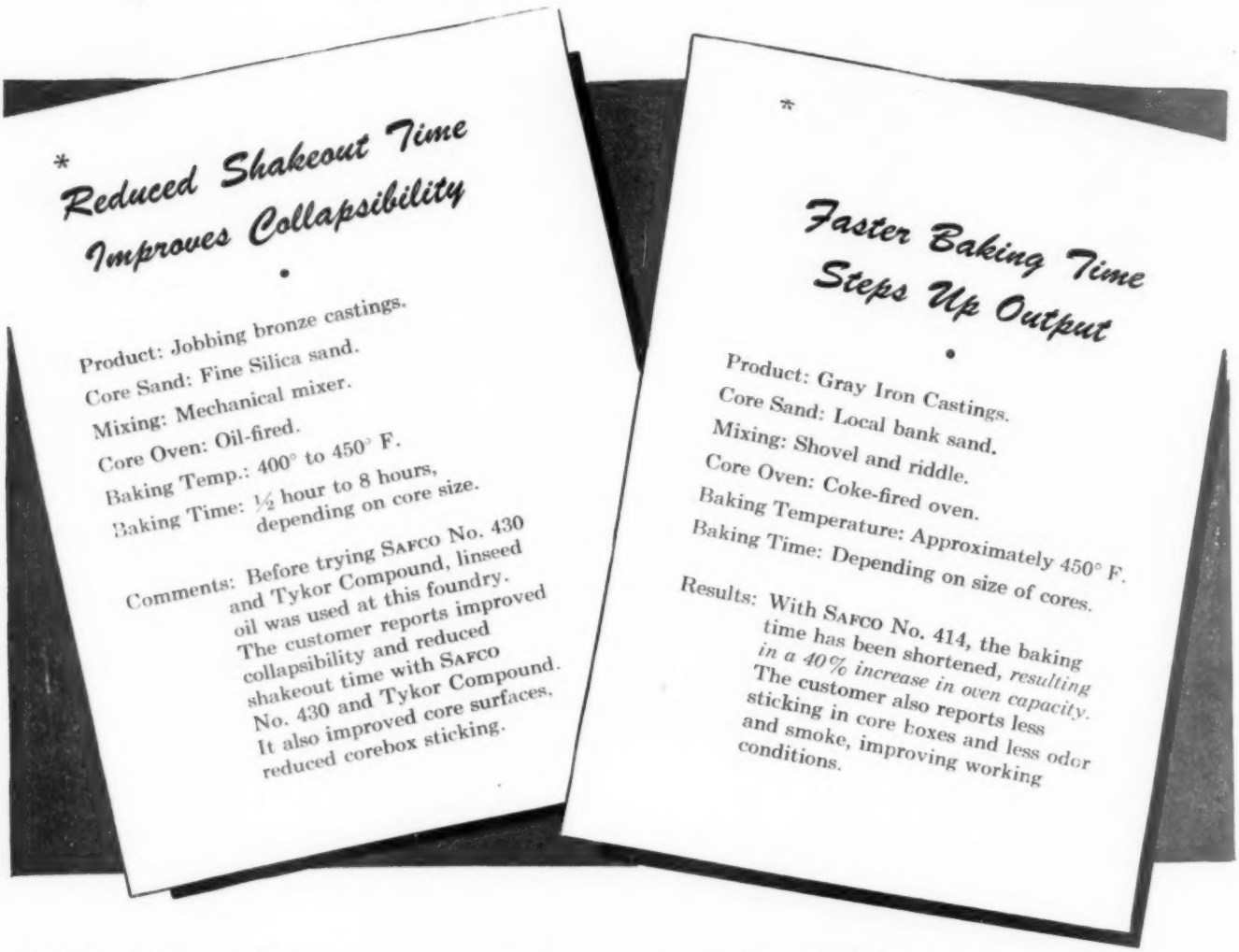
No. 40 MODEL A ROLLOVER



We'll Underwrite Your Test of SAFCO Core Oils

YOU'LL GET IMPROVED CORE PRODUCTION OR YOUR MONEY BACK!

* TWO RECENT FOUNDRY TEST REPORTS ON SAFCO CORE OILS


* Reduced Shakeout Time Improves Collapsibility
Product: Jobbing bronze castings.
Core Sand: Fine Silica sand.
Mixing: Mechanical mixer.
Core Oven: Oil-fired.
Baking Temp.: 400° to 450° F.
Baking Time: ½ hour to 8 hours, depending on core size.
Comments: Before trying SAFCO No. 430 and Tykor Compound, linseed oil was used at this foundry. The customer reports improved collapsibility and reduced shakeout time with SAFCO No. 430 and Tykor Compound. It also improved core surfaces, reduced corebox sticking.
* Faster Baking Time Steps Up Output
Product: Gray Iron Castings.
Core Sand: Local bank sand.
Mixing: Shovel and riddle.
Core Oven: Coke-fired oven.
Baking Temperature: Approximately 450° F.
Baking Time: Depending on size of cores.
Results: With SAFCO No. 414, the baking time has been shortened, resulting in a 40% increase in oven capacity. The customer also reports less sticking in core boxes and less odor and smoke, improving working conditions.

The test *results* outlined here are representative of hundreds which fill our files. SAFCO's superiority can be readily established—and convincingly demonstrated in *your* coreroom—with *your* superintendent as the test supervisor.

SAFCO Core Oils and Binders are compounded to meet a wide range of core requirements. They've proved their foundry-fitness under conditions of all kinds—helped to batter down core and casting costs in foundries of all types and sizes.

All we ask is your cooperation in letting a Swan-Finch Service Engineer analyze your requirements and recommend the SAFCO Core Oil best suited for your needs. If you're not satisfied that it gives better performance, we'll cancel your invoice. Why not write or phone our nearest office and ask to have the Swan-Finch man in your locality call—and arrange the details for you?

Swan-Finch Oil Corporation

R. C. A. BUILDING (WEST), NEW YORK 20, N. Y. • 2596 Hart Avenue, Detroit 14, Mich. • 201 North Wells Street, Chicago 6, Ill.

MAKERS AND MARKETERS OF SAFCO CORE OILS AND COMPOUNDS • SAFCO METAL WORKING LUBRICANTS
SAFCO MAINTENANCE LUBRICANTS • SAFCO LUBRICATING SPECIALTIES

PRODUCTION GOES UP

When You Grind Down Metals

WITH

SKILSAW

MODEL "SL"

SANDER-GRINDER

CLEANING METAL
• SKILSAW Sander-Grinder is amply powered for fast metal cleaning with wire brush.
GRINDING
• With cup grinding wheels, SKILSAW Sander-Grinder quickly grinds off waste metal.
SANDING
• SKILSAW Sander-Grinder speeds all sanding and finishing on flat or curved surfaces.

Put this SKILSAW Sander-Grinder on your surfacing jobs... and watch production climb! It has the extra power that removes waste metal *faster*... grinds off excess stock *quicker* ... cleans fins and scale from castings *in less time!* And Model "SL" is lighter, more compact for easier handling on every operation.

You'll find a hundred time-saving uses in your plant for SKILSAW Model "SL" Sander-Grinder . . . with sanding discs, wire brushes, cup grinding wheels and many other accessories. Let your distributor show you with a demonstration on any job you pick. *Phone him today!*

SKILSAW, INC.
5057-A Elston Ave., Chicago 30, Ill.
Sales and Service Branches in All Principal Cities

SKILSAW PORTABLE ELECTRIC TOOLS

★ MAKE AMERICA'S HANDS MORE PRODUCTIVE ★

THE PUBLIC IS BEING TOLD ABOUT FOUNDRY SANDS

Sand briquette before compression test

For almost a quarter century, the American Foundrymen's Association has conducted an intensive study into the physical and chemical characteristics and properties of foundry sands.

Throughout this intensive period of research, methods have been established to measure these properties and characteristics as applied to molding and core making, and machines have been perfected to make the established tests so that foundrymen in America and abroad can now compare their data and determine the fitness of various sands for specific purposes, and maintain control of their sands within closest limitations.

To tell the story of foundry sands to the layman in furtherance of the efforts of the American Foundrymen's Association, The Hydro-Blast Corporation has prepared a series of educational type advertisements which are appearing currently in the Atlantic Monthly, and these are being read with considerable interest as evidenced by the comments we are receiving.

Any foundryman desiring to receive reprints of the Atlantic Monthly sand series may have them by writing to us.

And Their Influence Upon Our Modern Civilization

Sand briquette after compression test

During the past seven years, The Hydro-Blast Corporation has developed methods of recovering and rehabilitating waste sand from foundries so that this reconditioned sand equals, and in some cases improves, the original sand grains as mined in a few favored locations in the United States, England and Belgium.

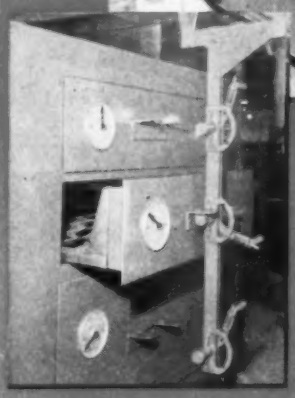
These Hydro-Blast developments have brought about reductions in freight transport ton miles, labor and money approximating 85 per cent in the many foundries where the Hydro-Blast system has been installed.

Because of the cooperation which America's foundrymen have given us in our efforts to solve some of their sand problems, we feel an obligation to tell the outside world about the importance of foundry sands and the influence of the foundry upon our way of life. Hence, our advertising messages will talk about foundrymen and foundry sands, rather than about Hydro-Blast.

It is our hope that this effort will, in some small measure, acquaint people in every walk of life with the contribution which American foundrymen are making to preserve and improve our modern civilization.

THE HYDRO-BLAST CORPORATION, 2550 N. Western Ave., Chicago 47, Illinois

Bake THICK and THIN Cores *at the same time!*



Features Of New Oven Drawers

HEAT SEAL insulating panel plugs drawer-opening when drawer is pulled out. Effectively prevents escape of heat from main chamber of oven.

EASY OPERATION assured by heavy-duty rollers on drawers and on drawer-operating vertical support-bar. Extra rugged.

SAFETY LOCK on drawer support-bar operates positively; no danger of slipping. Individual latch on each oven drawer.

NEW Despatch oven
ideal for production and special rush jobs

Allowing baking of both large and small cores at the same time, this new Despatch drawer-type oven offers every foundry advantages not found in most ovens: facilities for special rush-job baking in *addition* to regular production-baking—all in *one* oven! It quickly pays for itself in all-around utility, can't be beat as a time-saver.

An easy pull opens a drawer, even when loaded with heavy cores, and special heat-seal prevents escape of fast-flowing, uniform forced convection heat from main chamber. Thus thick and thin cores can bake simultaneously, in *same* drawer if desired, as removal of smaller "done" cores and replacement with green ones doesn't interfere with the smooth, rapid baking of other cores whose larger size demands a longer bake.

Eliminates Waiting; Boosts Output

This eliminates all the usual tedious waiting for production baking to get out of the way. Now you can put in *any* core *any* time there's space in a drawer. Added to the excellent productive capacity of the oven, this gives you *continuous corebaking* output when you need it, with remarkable convenience, speed and very low cost.

Available in gas-fired or oil-fired models, complete with automatic controls, and in various drawer-sizes. *Prompt deliveries assured.*

Mail this coupon today for complete details!

Clip coupon to your letterhead, please

DESPATCH OVEN CO.
722 Central Avenue, Minneapolis 14, Minn.
Please send me full details about your NEW DRAWER TYPE CORE OVENS.
☐ Gas-fired ☐ Oil-fired Drawer-size_____
Name_____
Company_____ State_____
City_____

DESPATCH OVEN COMPANY MINNEAPOLIS

Specify DINGS LIFTING MAGNETS *...for maximum P.L.H.*

LIFTING CAPACITIES IN POUNDS

Type of Material	SIZE OF MAGNET						
	18″	24″	29″	39″	45″	55″	65″
Slabs	3500	7000	13000	20000	38000	50000	65000
Skull cracker balls	3000	6000	11000	18000	24000	30000	40000
One ingot	3000	4000	6000	8000	10000	15000	30000
Machine cast pig iron	200	300	500	900	1600	2500	3500
Heavy melting scrap	200	300	500	900	1600	2500	3500
Sand cast pig	140	250	380	700	1350	2100	2900
Boiler plate scrap	130	250	500	700	1150	1500	2250
Punching scrap	150	250	350	600	800	1200	1600
Broken scrap	120	210	360	600	1100	1400	1800
Cast iron borings	110	200	350	600	1100	1500	2200
Steel turnings	50	100	200	300	450	800	1200

Built to give you more **P.L.H.** POUND LIFTING HOURS

DINGS *High Intensity* Lifting Magnets for fast, economical metal handling offer you features designed to provide maximum *pound lifting hours*, the measure of the length of time a magnet will maintain its maximum lifting capacity. A large coil with the correct proportion between copper wire and core steel insures high magnetic efficiency. The coil is securely anchored in place and impregnated with waterproofing compound to minimize chances of short circuits or coil failure. The body is rugged with radiating fins to aid in dissipation of heat which would weaken the magnetic pull. The bottom plate is made of special alloy steel to resist hard usage.

The Dings Lifting Magnet is designed by the world's largest exclusive builders of magnetic equipment to live up to the Dings reputation for high quality equipment. Catalog available on request.

DINGS MAGNETIC SEPARATOR CO.

512 E. Smith St., Milwaukee 7, Wis. Established 1899

Dings MAGNETIC SEPARATION HIGH INTENSITY

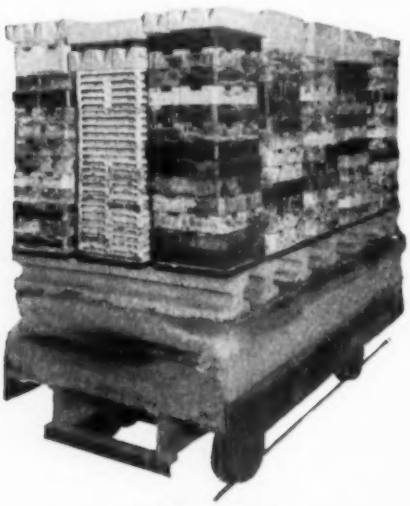
It is practical experience that counts in applying Super Refractories

IN firing steatite—roasting corrosive ores—treating metal parts—reducing and refining non-ferrous metals, radically different conditions are encountered. Yet, in these diverse operations there is a common need—the need for super refractories such as produced by Carborundum. With the variable conditions existing in these as well as numerous other types of installations, no one grade or kind of super refractory is capable of meeting their individual requirements.

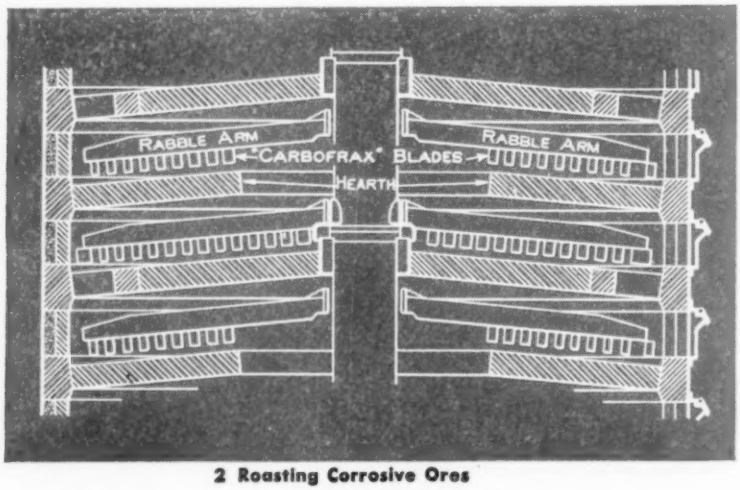
There are now more than sixty-five varieties of Carborundum Brand Super Refractories, each designed to withstand specific service needs. But of equal importance is the ability of our engineering staff to select the right super refractory for the purpose and apply it to a given installation.

Our comprehensive understanding of refractory problems—gained from years of practical and technical experience—has proved exceptionally valuable to war industry plants. It will be equally advantageous to operators of new and improved processes for the post war era.

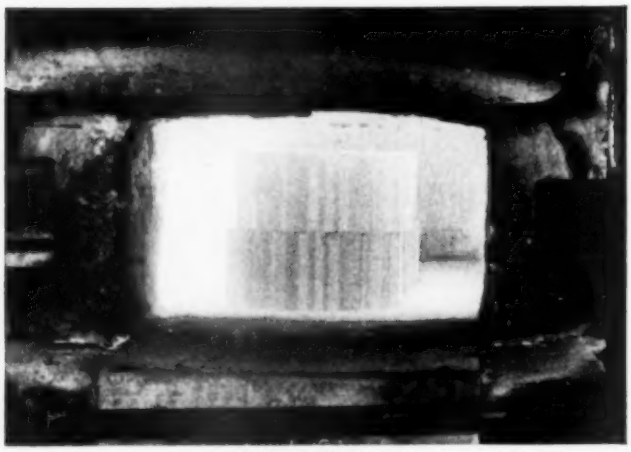
Let us consult with you on your refractory problems.



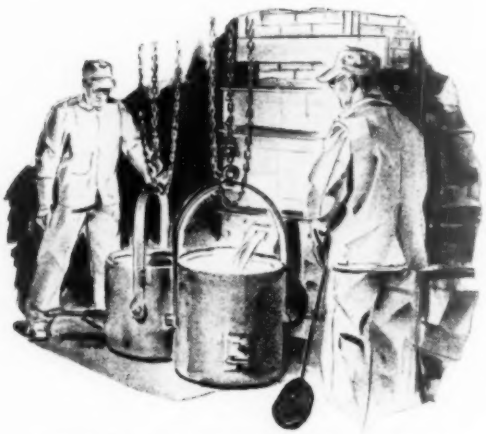
1 Firing Steatite



2 Roasting Corrosive Ores



3 Annealing



4 Reducing and Refining Non-ferrous Metals

Every hour this war is shortened will save $12,000,000. The lives it will save are priceless. Let's get it over with—quickly!

REFRACTORY CARBORUNDUM PRODUCTS

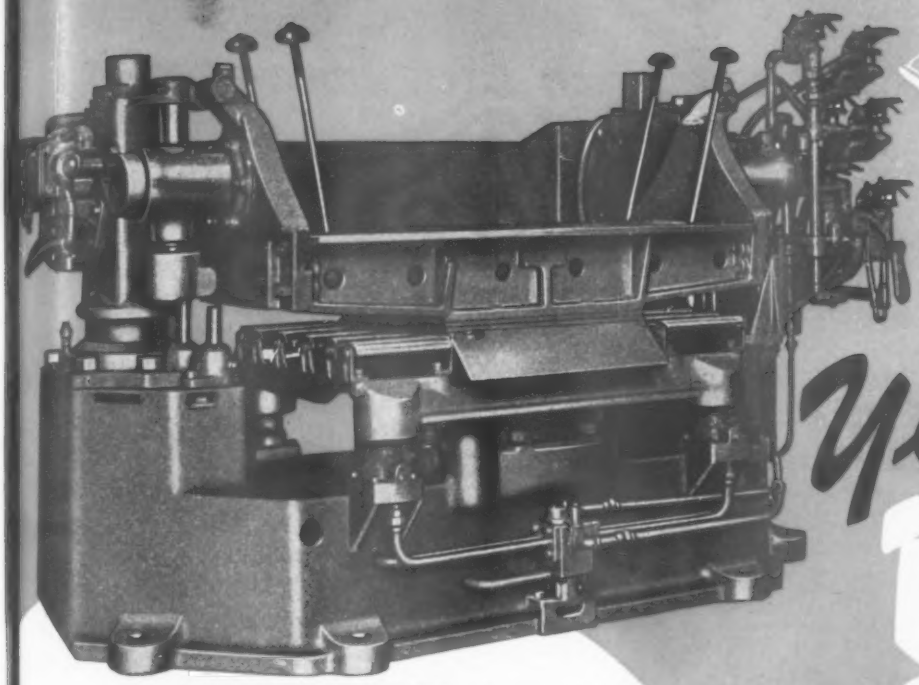
Refractory Division, **THE CARBORUNDUM COMPANY,** *Perth Amboy, N. J.*

REG. U. S. PAT. OFF.

MANUFACTURERS OF GRINDING WHEELS, COATED ABRASIVES, SUPER REFRACTORIES, HEATING ELEMENTS

District Sales Branches: Chicago, Philadelphia, Detroit, Cleveland, Boston, Pittsburgh. Distributors: McConnell Sales and Engineering Corporation, Birmingham, Ala.; Christy Firebrick Company, St. Louis, Mo.; Harrison & Company, Salt Lake City, Utah; Pacific Abrasive Supply Company, Los Angeles, San Francisco, Calif.; Denver Fire Clay Company, El Paso, Texas; Smith-Sharpe Company, Minneapolis, Minn.

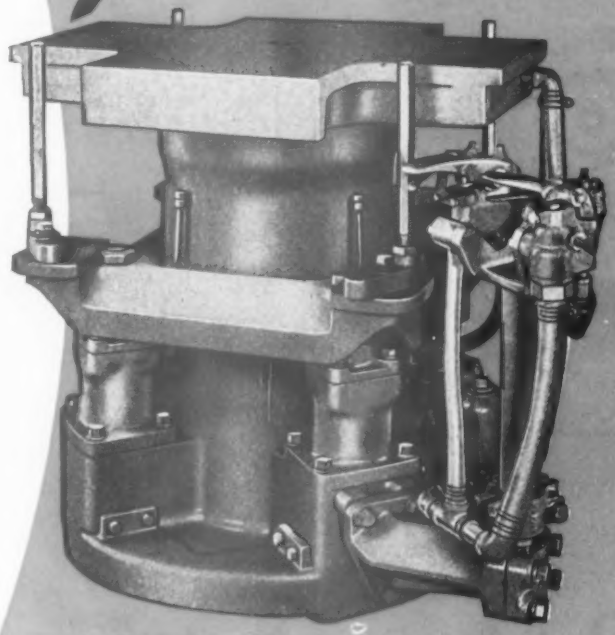
(Carborundum, Carbofrax, Alfrax and Mullfrax are registered trade-marks of and indicate manufacture by The Carborundum Company)



JOLT ROLLOVER DRAW Handles a wide range of work. Available in 6 sizes.

You Need BOTH in Your Foundry!

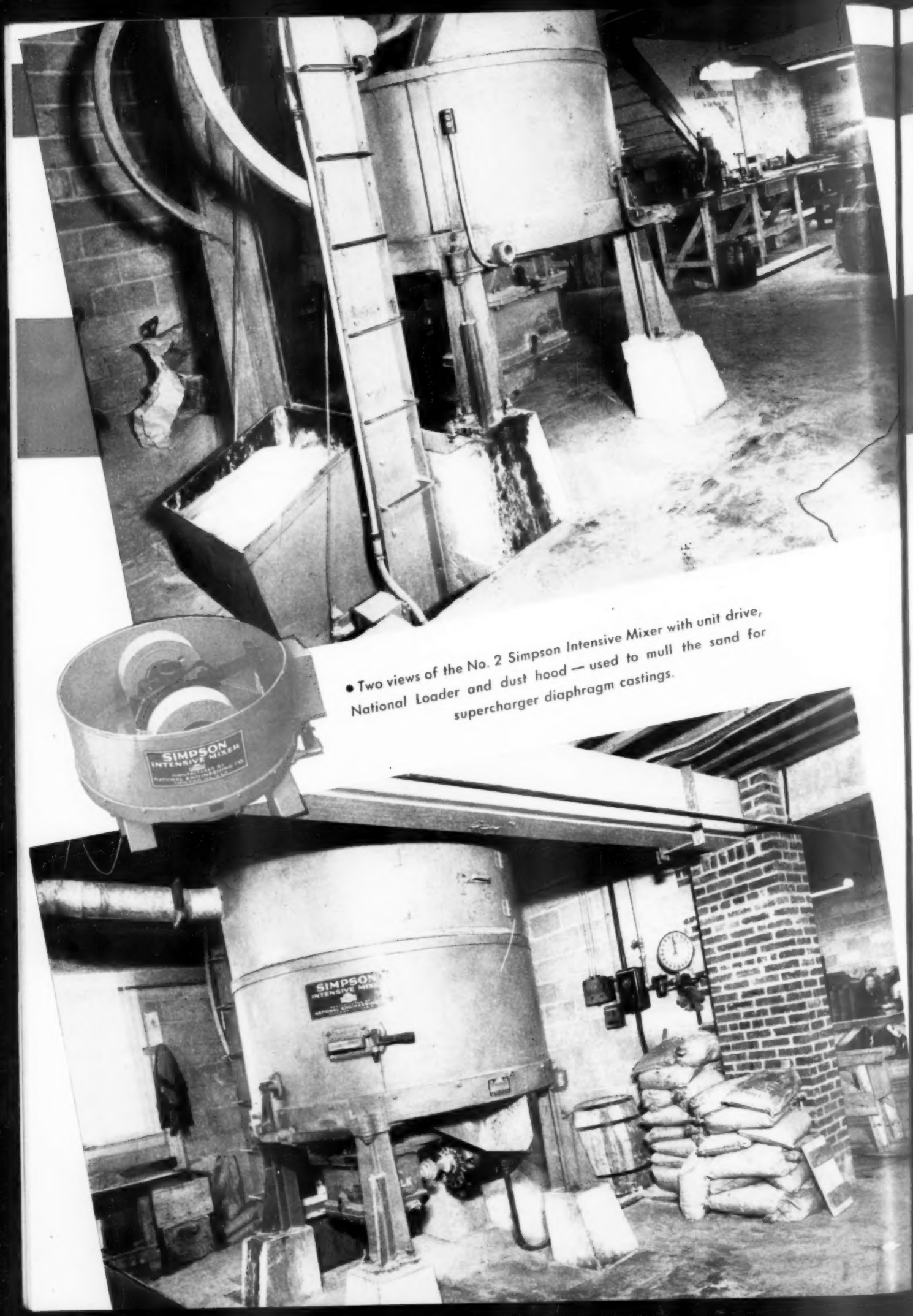
IF you want to attain PEAK production in your foundry, you need BOTH of these versatile molding machines. First of all, the Milwaukee High Speed Rollover equipped with automatic air clamps, power rollover and instantaneous hydraulic leveling. And then there's the Milwaukee Jolt Pin Lift with its solid, true jolting action and precise, controlled pattern draw. Both of these machines are engineered primarily for foundry jobs requiring inexpensive pattern equipment; and both produce molds at an unusually fast production speed, at the same time maintaining the highest quality standards. It will pay you to investigate what these two modern molders can do in your foundry. Write for literature.



JOLT PIN LIFT Simple in design with the fewest possible working parts. Lifting frame consists of rigid integral member actuated by four equally spaced pistons. Made in 6 sizes.

MILWAUKEE *Foundry Equipment* **Co.**

3238 W. PIERCE STREET, MILWAUKEE 4, WISCONSIN, U.S.A.



• Two views of the No. 2 Simpson Intensive Mixer with unit drive, National Loader and dust hood — used to mull the sand for supercharger diaphragm castings.

Where Sand Control Is VITAL

SIMPSON INTENSIVE MIXERS are the answer!

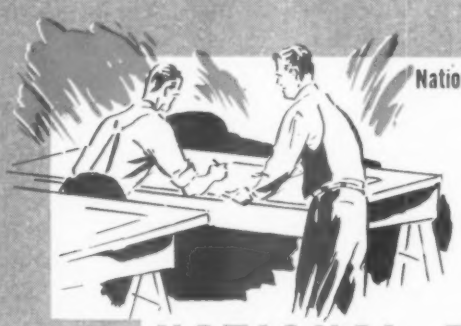
... supercharger diaphram castings, for example, are difficult because of their extremely thin sections, require absolute sand control — the kind of positive control and fast, thorough mixing provided by the Simpson Intensive Mixer.

• The No. 2 Simpson Intensive Mixer pictured here has been recently installed in the Diaphram Department of a medium sized alloy iron foundry, which casts supercharger diaphrams. This Simpson Intensive Mixer with it's heavy, broad faced mullers, gives the true smearing action so necessary to *thoroughly, uniformly and swiftly* mull the sand. This is one of many instances of ticklish production and sand control problems that Simpson Mixers have helped solve.

This Simpson has a unit drive which provides efficient operation and saves space. Also, the machine is equipped with a National Bucket Loader to accelerate sand production and dust hood to improve working conditions. Two other Simpson Mixers are also in use in this foundry.

During the last two years more than 1000 Simpson Intensive Mixers have been installed in foundries of all types to provide fast, thorough, controlled mixing in foundries that have been called upon to produce a maximum number of high quality castings for war. Too, in the last two years, National has created complete sand preparing, sand reclaiming, sand and mold handling units for more than 50 major foundries for production of malleable, aluminum, magnesium, steel, heavy grey iron and non-ferrous castings.

Investigate the advantages of "Controlled Mixing" with Simpson Intensive Mixers, and complete National Sand Systems. A National engineer will gladly call and go over your sand preparation and sand control problems with you.



National Engineering Service **National Field Service**

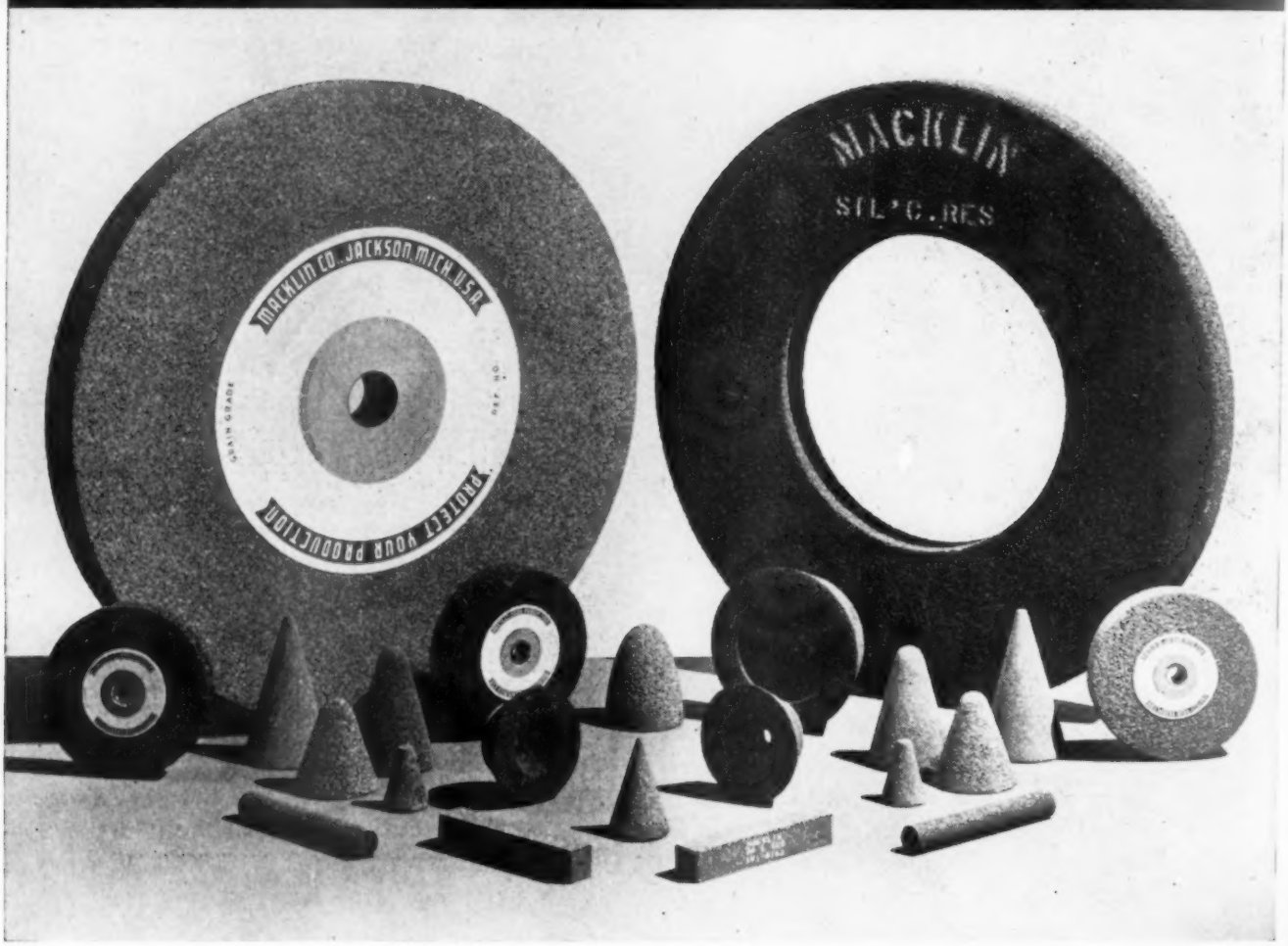
For more than 30 years National Engineering and Field Service, has helped hundreds of foundries solve problems in sand preparation, reclamation, handling, storage and control. Today, National Engineers are constantly on the job helping foundries with problems of sand handling and control on construction, maintenance, repair or new requirements. National Engineering and Field Service is available and eager to help you whenever and wherever you need it.

NATIONAL ENGINEERING COMPANY

MACHINERY HALL BUILDING • CHICAGO 6, ILLINOIS

Manufacturers and Selling Agents for Continental European Countries: —The George Fischer Steel & Iron Works, Schaffhausen, Switzerland. For the British Possessions, Excluding Canada and Australia — August's Limited, Halifax, England. For Canada — Dominion Engineering Co., Ltd., Montreal, Canada. For Australia and New Zealand — Gibson, Battle & Co., Pty., Ltd. Sydney, Australia

MACKLIN GRINDING WHEELS



FOUNDRIES, large and small, require grinding wheels in many sizes, shape, grains and grade combinations.

Macklin Company is thoroughly equipped to produce high quality grinding wheels for all foundry requirements.

No matter what your grinding problems may be there is a Macklin wheel to fit the job that will "Protect Your Production."

Ask for the services of a Macklin Field Engineer.

Invest in War Bonds

MACKLIN COMPANY

Manufacturers of GRINDING WHEELS—JACKSON, MICHIGAN, U. S. A.

Distributors in all principal cities

***Sales Offices:*—Chicago - New York - Detroit - Pittsburgh - Cleveland - Cincinnati - Milwaukee - Philadelphia**

Here are the full facts on this new, vital development for better cores..

Houghton's Hy-Ten

DRY CORE BINDERS

A definite advance in core-making, for these reasons:

1
Baking time cut in half

2
Casting finish improved

3
Rapid collapsibility

4
Cereal binder practically eliminated

5
No odor or toxic conditions

Hy-Ten #200 ... for grey iron and steel foundries

NO OIL—LITTLE OR NO CEREAL—SIMPLY MIX WITH SAND AND WATER

Hy-Ten Core Binder No. 200 is the new dry core binder developed for cores used in grey iron and steel foundries.

This is based on an inert, finely pulverized mineral. It is not similar to any dry binders formerly offered, some of which contained pitch which smoked and burned. Hy-Ten does not give off irritating or toxic fumes.

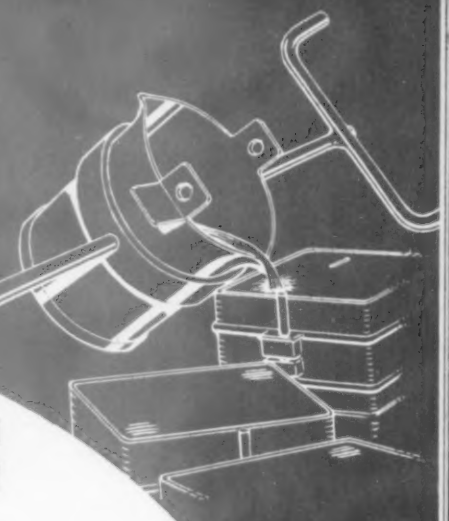
Its formula uses no oil; simply mix with sand—1 to 15 or 1 to 20 by weight—mull for seven minutes, with 3% to 4% moisture. Cores are baked at 425° to 450° F.

As compared to the oil method, it will be found that the Hy-Ten binder provides cores with good external hardness—85 to 90 Dietert—yet a softer center, which means better collapsibility. This feature is somewhat comparable to carburized steel, hardened outside but with a softer ductile center, as contrasted to steel hardened homogeneously, all the way through. Although tensile strength is lower than with oil, that property is not deemed as important as is ready collapsibility after metal is poured.

The lack of need for cereal binder in the new core formula is also very pertinent in these times when cereal binders are scarce and hard to obtain. In 80% of the cores made to date with Hy-Ten Dry Core Binder no cereal was used. In the other 20% only ½ of 1%, or less, was used.

Another factor observed in our development work among foundries was the improved casting finish which this binder makes possible. Finish depends on how well the core stands up under heat. The "refractoriness" of the core seems to have been improved.

From the foregoing it is apparent that Hy-Ten Dry Core Binder No. 200 will prove of vital interest to foundrymen, who are invited to write for test runs under their own shop conditions.



PERFORMANCE

..."the proof of the pouring is in the finished casting"

Not claims, but *results!* Here are instances of definite improvement in cores over the time-honored method of mixing oil and sand.

BAKING TIME CUT IN HALF

A steel foundry, "tops" in its line, sought relief from core troubles. Certain castings seemed almost impossible to make because the metal burned into the core so badly that practically no cored area remained. Cleaning costs were "beyond reason."

They tried Hy-Ten Core Binder No. 200, with these definite, concrete results:

1. Baking time reduced one-half.
2. Cores now do not over-bake.
3. Practically all cereal binder eliminated.
4. Smoking conditions relieved.
5. Saving of nearly $1.00 per ton of core sand.

That's practical proof—facts you'll want to know when investigating this new, different type of binder.

FOR BACK-UP SAND

A large Indiana foundry tested Hy-Ten Core Binder No. 200 for back-up purposes using this formula:

1000 lbs. Crushed Reclaimed Michigan City sand (not burned).

50 lbs. Hy-Ten Core Binder No. 200.

2 qts. Cereal Binder (formerly used 16 qts.).

This foundry has adopted this formula after intensive study and test, because it resulted in:

1. Cores which were easier to break up when shaking out castings.
2. Cleaner castings—brighter metal.
3. Smoke reduced 75% when molds were poured.
4. Baking time reduced.
5. Cereal, a critical material, cut from 16 to 2 qts. per 1000 pound mix—and may be entirely eliminated.

Repeat orders bear out the endorsement of this foundry. Performance—not promises!

Similar tests have been run in more than fifty foundries.

HOUGHTON FOUNDRY RESEARCH TO AID AMERICA'S CORE ROOMS

FOR NON-FERROUS CASTING...

Hy-Ten #100

THE ability of a core to hold up under the pouring of metal, yet collapse readily after the metal has set, is a requisite particularly for non-ferrous metals poured at much lower temperatures than iron or steel.

In the past, core binders composed of an aqueous solution of urea formaldehyde have been offered, but objections arose because of obnoxious odor, and too rapid air-drying.

Hy-Ten Core Binder No. 100 has now been perfected for non-ferrous foundries. This base is the same inert mineral used for the No. 200 type, combined with other materials to form a semi-plastic product which does not air-dry too rapidly, and which *cures* under heat. Baking time is reduced because curing of the core begins while the moisture is being driven off.

A typical core formula is 1 pound of Hy-Ten Core Binder No. 100 to 100 pounds of silica sand, 3 to 4% water, and 0.25 to 0.50% of cereal binders, depending upon green strength required.

Houghton has long supplied a superior core oil for non-ferrous casting and does not offer this new dry core binder as an immediate replacement for such oils. We do feel, however, that tests made to date indicate certain definite needed advantages, as set forth in a recent discussion at the American Foundrymen's Association, (Transactions, P. 155, September, 1943.)

• • •

These dry core binders are the result of research and development work done quietly over the past year, and now announced in detail because it is our opinion that they constitute a definite advance in the science of core-making. For trial and test, write our Foundry Research Department, 303 West Lehigh Ave., Philadelphia, 32 West Randolph St., Chicago, or 7 West Grand Blvd., Detroit.

HOUGHTON PRODUCTS for the METAL INDUSTRIES

- CARBURIZERS
- CUTTING OILS
- QUENCHING OILS
- CLEANING COMPOUNDS
- PICKLING INHIBITORS
- RUST PREVENTIVES
- HEAT TREATING SALTS
- INDUSTRIAL LUBRICANTS
- LEATHER BELTING AND PACKINGS

E. F. HOUGHTON & CO.

Oils, Leathers and Metal Working Products

PHILADELPHIA • CHICAGO • DETROIT • SAN FRANCISCO

FUEL Economy AND FURNACE Efficiency

Correct furnace atmosphere is all important for best melting conditions with fuel economy at its highest and melting speed at its best for all purpose economy. Wartime light metal melting experience has established that the best conditions for pot life and efficiency of heating are reached when a "neutral" furnace atmosphere can be maintained with maximum CO_2 and only a trace of CO and free oxygen present.

A prime requisite in obtaining this ideal condition is the use of multiple burners with a proportional mixer or equal for maintaining the proper gas and air mixture, and an air-oil ratio controlling device if oil is used.

These and other principles, although not commonly taken into full consideration, are a basic part of the design of Fisher Furnaces and are features which will be sought, after the day returns when low operating costs will be of first importance again. Fisher's Non-Ferrous Metal Melting experience also offers you (1) the benefit of many years of experience in foundry equipment coordination and (2) a wide selection of melting furnaces including electric and hydraulic tilting, hand tilting and stationary types incorporating the latest mechanical features, with a capacity for every purpose.

Present your Non-Ferrous Melting and Layout problems to Fisher. Write for complete information.

A battery of Fisher Electric Tilting Nose Pour Furnaces in a modern foundry in California. As a wartime emergency measure these furnaces were designed to be fired with either gas or oil with quick change-over.

Capacities shown are 1200 pounds of brass, or 400 pounds of aluminum.

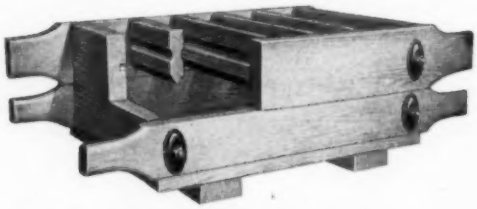
5519 North Wolcott Ave., Chicago 40, Ill.

Fisher FURNACE COMPANY

Engineers and Manufacturers

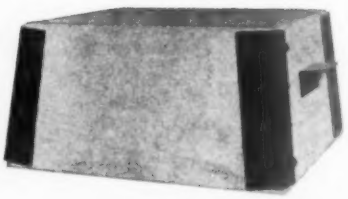
CMD FIRE-RESISTANT BOTTOM BOARDS

The surface of these long-life bottom boards is made practically fire-proof by a highly efficient covering of **"Linasbestos,"** which is wood-screwed to the board and cleats. Only CMD Bottom Boards can offer you **"Linasbestos"** protection. Available in any sizes.



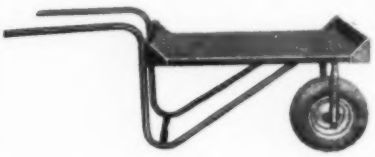
CMD WOOD FLOOR FLASKS

Made of No. 1 grade Norway Pine, with **strong reinforcing rods,** one-half inch thick, inside cope and drag. On **large sizes,** where cope or drag is over 8 inches in depth, **double tie rods** are used. Cross bars can be shaped and beveled to conform to the contour of your pattern. One bottom board is furnished with each flask.



CMD NON-WARP, NON-BURN COMPOSITION JACKETS

Made of strong light-weight **fire-safe "Linasbestos"** are non-burning and non-warping. They are heavily reinforced not only with thick angle iron corners but with **angle iron braces all around the sides and ends.** Handles are bolted on.



CMD PNEUMATIC CORE BARROW

In busy, crowded places around your foundry, this **easy-to handle CMD Core Barrow** speeds up safe delivery of large cores to molders.

Ask For

CMD

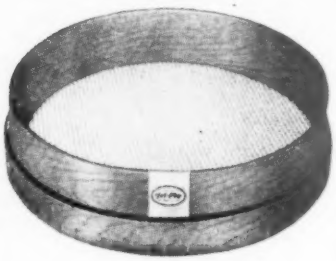
FOUNDRY SPECIALTIES

Because war time is no time to experiment, foundrymen, more and more, are turning to CMD for flasks, jackets, core conveyors, chipping hammers, crucible skimmers and other foundry specialties. CMD products have proved their worth; and reflect 22 years of leadership in meeting the specialized needs of the foundry industry. Write for illustrated circulars on the complete CMD line.

CHICAGO MANUFACTURING & DISTRIBUTING CO.

Dept. 6F, 1928 West 46th Street

CHICAGO, ILLINOIS

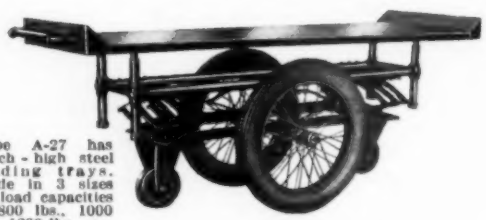


TRI-PLY FOUNDRY RIDDLE

Split-proof frame is made of three plys of hardwood. Screen of the finest galvanized wire (of any popular mesh desired) is tightly assembled and **thoroughly stapled to frame.**

TEXTITE AIR SEPARATOR

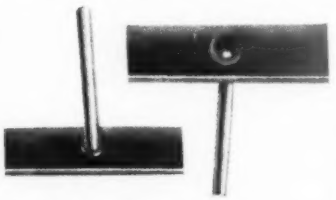
Cools, cleans and dries the air in one operation. **No moving parts** to replace. Saves air tools. Write for illustrated circulars.



Type A-27 has bench-high steel loading trays. Made in 3 sizes for load capacities of 800 lbs., 1000 lbs., 1200 lbs.

CMD PNEUMATIC CORE TRUCKS

Minimize core chafing and breakage and **reduce core-handling cost 50 to 75 per cent.** They have in addition to pneumatic tires and elliptical springs an exclusive inner coil spring in each upright support that assures maximum resilience even under light loads.



SLAG SKIMMING AND RABBLING IRONS

Made of high heat-resisting wrought iron. Handles upset on both sides of plate. **Quantity production** at **low cost.**

Important Advancement
IN FERRO-ALLOY BRIQUETS

NOW . . . A FULLY USEFUL PROTECTIVE BINDER

THIS ACHIEVEMENT dispels the old belief that a pitch binder for ferro-alloys would melt when heated, resulting in a crumbling briquet. These OFA Briquets, during the heating operation, produce a carbon binder which protects the readily oxidized ferro-alloy up to its alloying in the iron. It is then consumed as part of the charge without producing an added refractory slag burden.

YEARS have been devoted to find this "ideal" binder. We have prepared an interesting brochure containing complete factual information with actual production tests that prove the advantageous utility of this entirely new metallurgical application to ferro-alloy briquet binding. SEND FOR YOUR COPY TODAY.

IMMEDIATE DELIVERY *in tonnages to meet your requirements. Ferro Silicon briquets containing either one or two pounds of contained silicon, Ferro Manganese and Ferro Chrome briquets containing 2 lbs. of alloy—shaped for easy storing—colored for easy identification.*

WRITE TODAY FOR NEW FACTUAL BROCHURE

PATENT PENDING

PHILO RAINIER

Ohio Ferro-Alloys Corporation
Canton, Ohio

Chicago Detroit Pittsburgh San Francisco Tacoma

Fremont Flasks again available in
MAGNESIUM METAL

PROMPT ATTENTION GIVEN ALL ORDERS

FREMONT FLASKS have established a reputation for efficiency and long wear and in most progressive foundries have replaced the old type, cumbersome, heavy weight equipment.

The FREMONT FLASK with the 1" GROOVLOCK PIN is especially adapted to snap work but can also be furnished with cast ears to accommodate other pins.

Slip Flasks FREMONT GROOVLOCK Jackets

THE FREMONT FLASK CO...FREMONT, OHIO

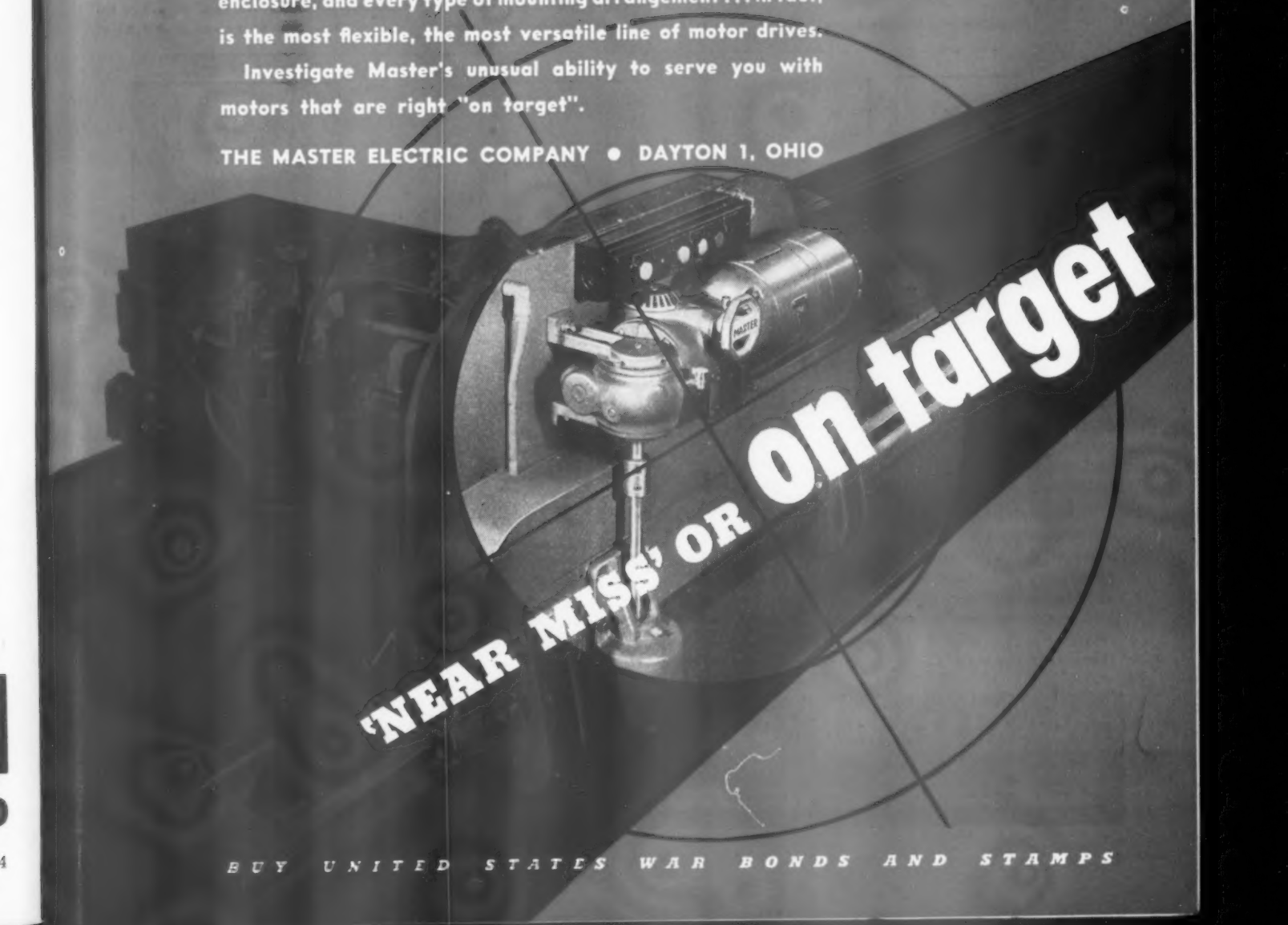
"Near misses" will never win your battle for tomorrow's markets . . . you'll have to be right "on target".

That goes for your motor applications too, and you'll find the job easier if you'll let us help. For example, the motor drive shown below is right "on target". By incorporating a motor, an electric brake, a mechanical variable speed unit, and a gear reduction . . . all designed and built into one compact integral power unit . . . it provides variable speed at exactly the right range and in addition can be quickly and accurately stopped at exactly the point desired. It mounts neatly on the machine, saves space, saves money and greatly improves the output, safety, appearance and convenience of the equipment.

Probably you will not need exactly the same combination of motor features illustrated below, but the Master line includes motors for every current specification, every type of enclosure, and every type of mounting arrangement . . . in fact, is the most flexible, the most versatile line of motor drives.

Investigate Master's unusual ability to serve you with motors that are right "on target".

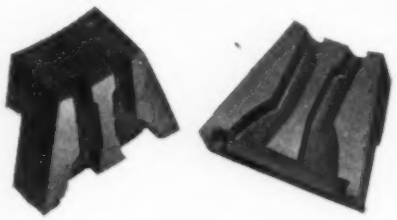
THE MASTER ELECTRIC COMPANY • DAYTON 1, OHIO



BUY UNITED STATES WAR BONDS AND STAMPS

Only Carbon and Graphite Provide All These Properties for Casting Molds, Ingot Mold Plugs and Stool Inserts:

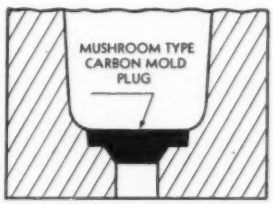
STRENGTH • RESISTANCE TO THERMAL SHOCK • NO CRACKING, SPALLING OR STICKING • FREEDOM FROM INCLUSION • LIGHT WEIGHT • LONG LIFE • LOW COST



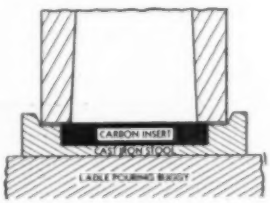
Sections of a machined graphite mold for centrifugal casting of small metal parts

Machined graphite mold

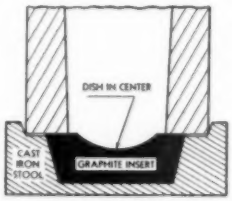
Standard tapered carbon mold plugs available in two sizes. (Other sizes on order)



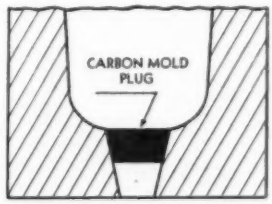
Mushroom type carbon mold plug. Like tapered plug, it replaces ceramics and metal



Showing a machined carbon or graphite slab, used as a stool insert to replace cast iron



Either carbon or graphite stool insert, with dished surface, to replace copper



Another view of standard tapered carbon mold plug, replacing ceramics or metal

MEETING severe requirements—often where difficulties are experienced with other materials—"National" carbon and graphite molds, mold plugs and inserts today are boosting production and lowering costs for a wide range of casting and molding operations in both the ferrous and non-ferrous industries.

Outstanding properties of both carbon and graphite are responsible for these gains. Carbon and graphite resist thermal shock, eliminating spalling and cracking and the possibility of inclusions. They are not "wet" by molten metals. Mechanical strength and original physical shape of carbon and graphite products are maintained up to the highest temperatures involved in casting operations, with negligible thermal expansion. Their light weight and low cost are of paramount importance in many metal casting and molding operations.

The various ingot mold plugs and stool inserts, and the graphite molds shown here are but a few of many carbon and graphite products supplied to the metals and alloys industries by National Carbon Company, Inc. Write today for catalog Section M-8000 listing other applications, along with valuable properties tables of "National" and "Karbate" carbon and graphite materials.

The words "National" and "Karbate" are registered trade-marks of National Carbon Company, Inc.

★ BUY UNITED STATES WAR BONDS ★

NATIONAL CARBON COMPANY, INC.

Unit of Union Carbide and Carbon Corporation

CARBON PRODUCTS DIVISION, Cleveland 1, Ohio UCC New York, Pittsburgh, Chicago, San Francisco

Final Control of Dust and Fumes

A Schneible System abates dust and fume nuisances with a thoroughness which not merely complies with State laws, but assures the continuous clean air which is so essential to maximum working efficiency.

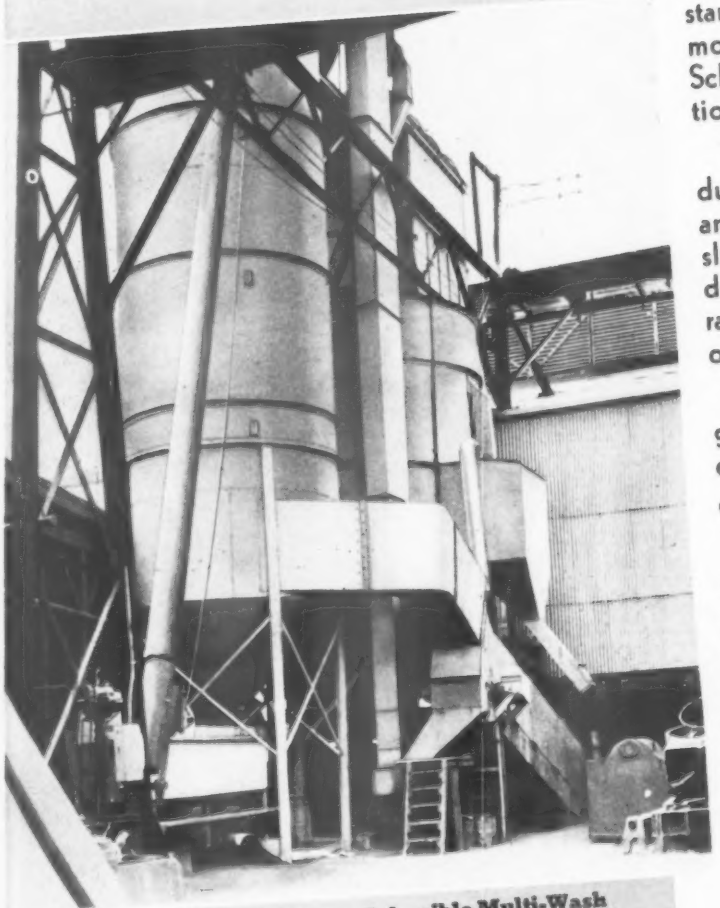
The first cost of a Schneible Dust Control System is practically the final cost. Correctly designed and built for long, trouble-free operation, there are no rapidly wearing parts; nothing to break, burn or clog; nothing to shake down; no filters to repair. They are non-freezing, are unaffected by heat, cold or moisture, and render 24-hour-a-day service year after year with a very minimum of maintenance.

No attendance is required other than to start and stop the system. Switch on the motor and open the water valve, and a Schneible Multi-Wash Collector will function indefinitely.

There is no bothersome accumulation of dust to dispose of with a Schneible. Dust and fumes are removed automatically as sludge. The water (or oil, for magnesium dust) used as a cleansing medium is separated from the solids and used over and over again.

When a Schneible Multi-Wash System goes into service in your foundry, that date marks the final settlement of your dust and fume problems.

Schneible Multi-Wash Collectors are made in a wide range of capacities for every requirement; from ventilating an entire foundry down to a bothersome individual dust creating operation. May we send you informative bulletins?



A 30,000 c.f.m. Schneible Multi-Wash Collector at a large west coast steel jobbing foundry.

CLAUDE B. SCHNEIBLE CO.

2827 Twenty-Fifth Street

Detroit (16), Mich.

Engineering Representatives in Principal Cities

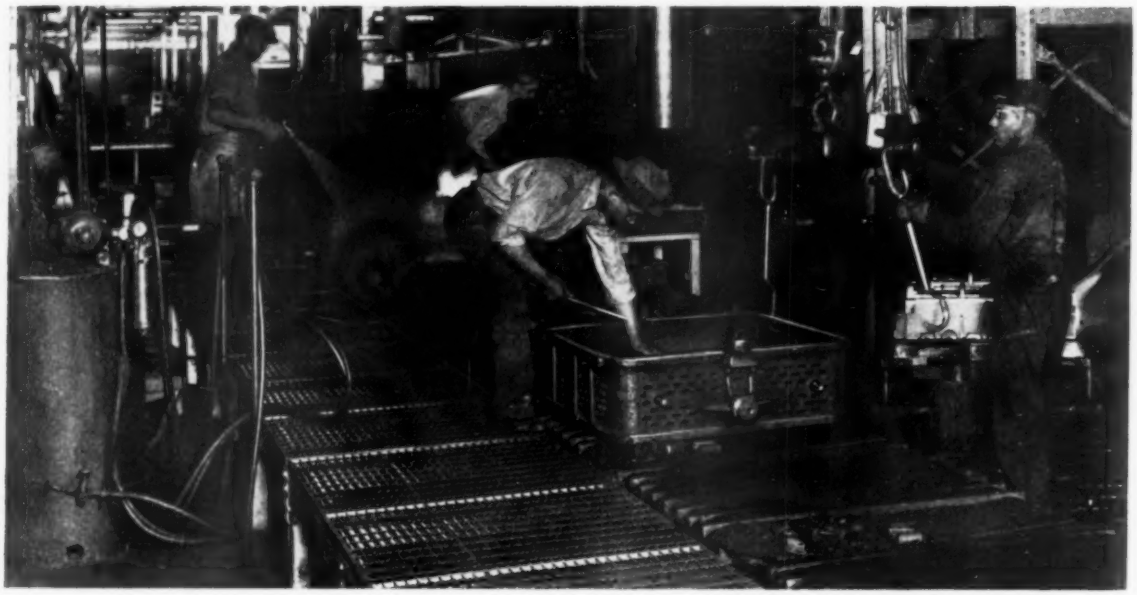
SCHNEIBLE

DUST, ODOR AND FUME CONTROL EQUIPMENT

To the FOUNDRYMEN of today

VULCAN GREEN SPRAY

is another McCormick development



Spray it on green sand molds (skin dried) for good finish and fast cleaning.

Vulcan Green Spray performance has been proven on many production lines making various types of Diesel and motor castings.

No shortage — prompt shipments — low cost

Try a sample.

J. S. McCORMICK CO.
PITTSBURGH, PA.

MAKERS OF INSULATORS AND BINDERS FOR FOUNDRY SANDS

WHENEVER LOADING AND UNLOADING OF MATERIALS MUST BE DONE QUICKLY and ECONOMICALLY
it's a LINK-BELT SPEEDER ON THE JOB of course
LINK-BELT

Finger-tip control and rugged, maintenance-free service are just two of the advantages that Link-Belt Speeder machines are providing war-busy plants throughout the country. There are 25 different models of Link-Belt Speeder shovels, draglines and cranes available—a type and size to fit every job.

9428

LINK-BELT SPEEDER

Builders of the Most Complete Line of
SHOVELS-CRANES-DRAGLINES

LINK-BELT SPEEDER CORPORATION, 301 W. PERSHING ROAD, CHICAGO-9, ILL.
(A DIVISION OF LINK-BELT COMPANY)

ROTO-CLONE INSTALLATIONS ARE COMPACT

THIS ROTO-CLONE COLLECTS DUST FROM THE SHAKE-OUT, SAND HANDLING AND CONDITIONING EQUIPMENT INCLUDING BELT TRANSFERS, ELEVATOR AND BREAKER SCREEN

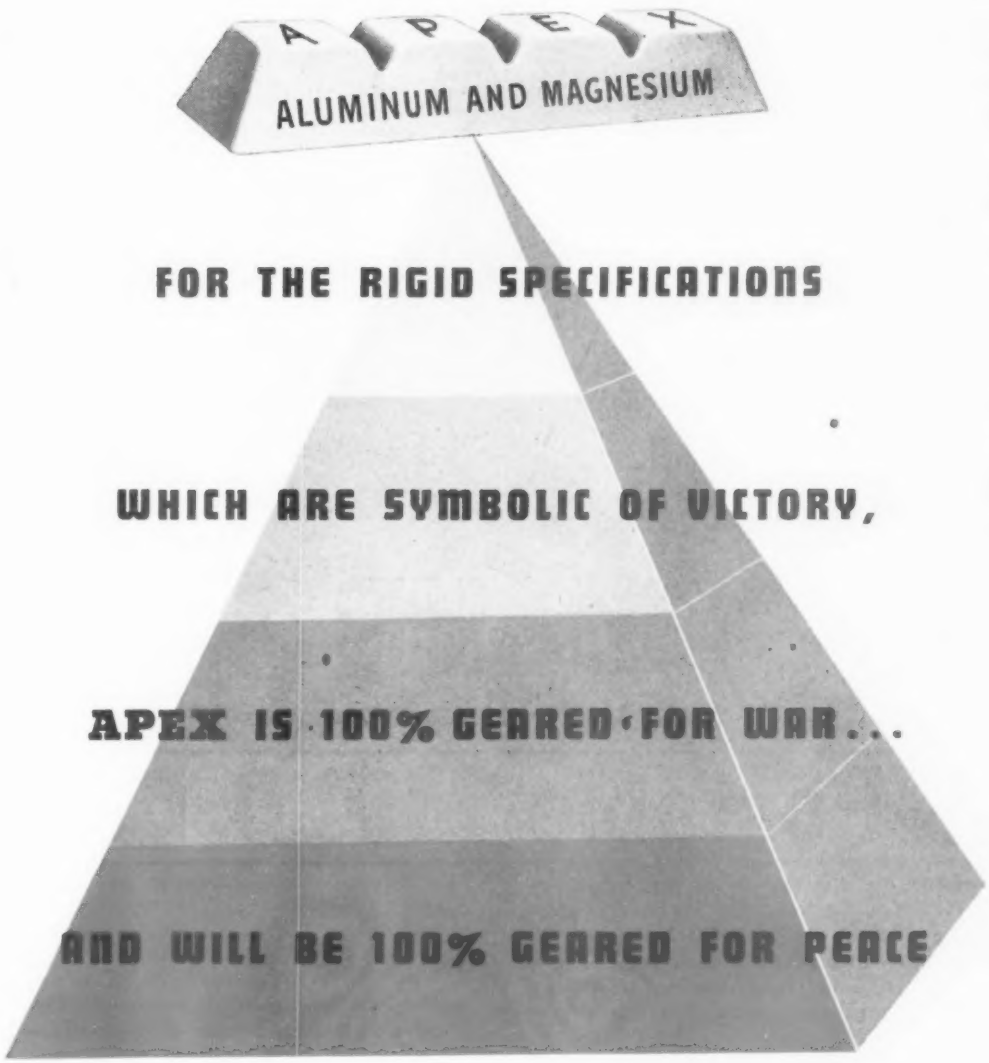
THE compact design of the Type W Roto-Clone is very apparent in the small space required for its installation in this typical mid-western foundry. In addition to saving valuable space, these further exclusive advantages contribute to its wide spread acceptance . . . highest efficiency in dust separation; constant air exhaust under all operating conditions, regardless of high temperatures or presence of steam; ease of erection and low operating cost.

Complete engineering data will be sent without obligation. Write for latest bulletin No. 274A

AMERICAN AIR FILTER COMPANY, INC.
INCORPORATED
266 Central Avenue **Louisville 8, Kentucky**
In Canada: Darling Bros., Ltd., Montreal, P. Q.

AAF **Roto-Clone**
FOUNDRY DUST CONTROL

APEX


APEX
ALUMINUM AND MAGNESIUM
FOR THE RIGID SPECIFICATIONS
WHICH ARE SYMBOLIC OF VICTORY,
APEX IS 100% GEARED FOR WAR...
AND WILL BE 100% GEARED FOR PEACE

SMELTING

COMPANY

CHICAGO, ILLINOIS

How Do YOU Dry BIG Molds?

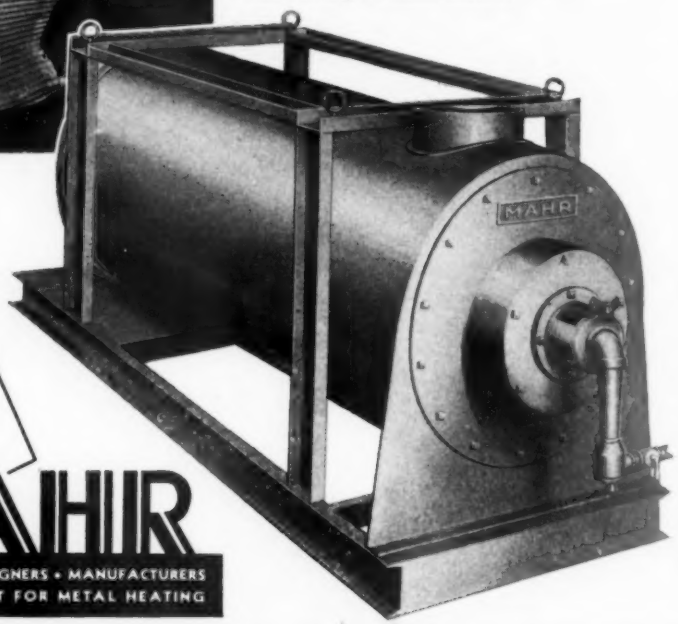
Here's How One Foundry Cut Drying Time from 45—50 Hours to 18!

This huge mold will make a 20,000 lb. casting for a marine motor base. If dried in an oven in the usual way, it would take 45 to 50 hours. With two MAHR Portable Mold Dryers on the job, as shown in illustration at left, the mold was ready for pouring in only 18 hours! That's a big step toward "beating the promise" on delivery—and a real saving in Man Hours.

ANOTHER FOUNDRY SAYS...

LYNCHBURG FOUNDRY CO.
Lynchburg, Va.

"We are using the MAHR Portable Mold Dryer in drying the mold of low pressure cylinder castings, which castings are ultimately used on our Victory ships. Our old method of drying these molds was to put the entire mold on an oven car, put the car in the oven and dry the mold from 36 to 48 hours. With the mold dryer we are able to leave the molds on the foundry floor and dry them in an average time of 18.2 hours. We like this unit so well that we have ordered another one from you which we are very anxious to receive."



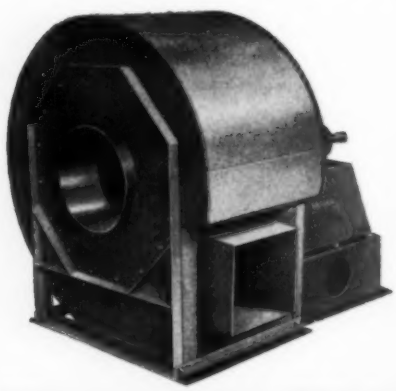
MAHR
ENGINEERS • DESIGNERS • MANUFACTURERS
ALL EQUIPMENT FOR METAL HEATING

OIL OR GAS FIRED Portable MOLD DRYER

There are many reasons for the sensational performance of this modern MAHR unit. It dries from the inside out,—the sand is baked only to the depth needed from the core. All the sand does not have to be baked through from the outside in. Shake-out is easy, and sand does not necessarily have to be reconditioned after each casting.

Heat-up time is extremely fast. Large volumes of hot gases are forced into every part of the mold for fast, complete drying. Normal drying times are radically shortened.

The entire unit is mounted on a heavy channel steel frame, and can be quickly moved and set up for use on any large mold. Fuel may be either gas or oil. Economy in operation is one of its features because of rapid and complete combustion. Made in 4 sizes—250,000—500,000—750,000—1,250,000 BTU capacity.



MAHR Temperature Fans

When your recirculating fans on core ovens, heat treating furnaces and other high temperature applications "pass out" on you long before they should—perhaps you get a little hot yourself and say,—"Why doesn't somebody build a fan to stand up to this kind of work?" That's EXACTLY what MAHR has done! MAHR Temperature Fans were designed and built for recirculating hot gases in our own heat treating furnaces—and for that purpose only. No adapting or remodeling, but a rugged, efficient, high temperature fan for work from 800° F. to 1500° F.—and it really does a job! Many exclusive features. 10 sizes, 800 to 40,000 cfm.

WRITE FOR BULLETINS—on MAHR Portable Mold Dryer—Bulletin 1050. On MAHR Temperature Fans—Bulletin 1070. Or get the whole story from any MAHR representative.

Sales Offices in Principal Cities

MAHR MANUFACTURING CO.
DIVISION OF DIAMOND IRON WORKS, INC.
1709 NORTH SECOND ST. **MINNEAPOLIS, MINN.**

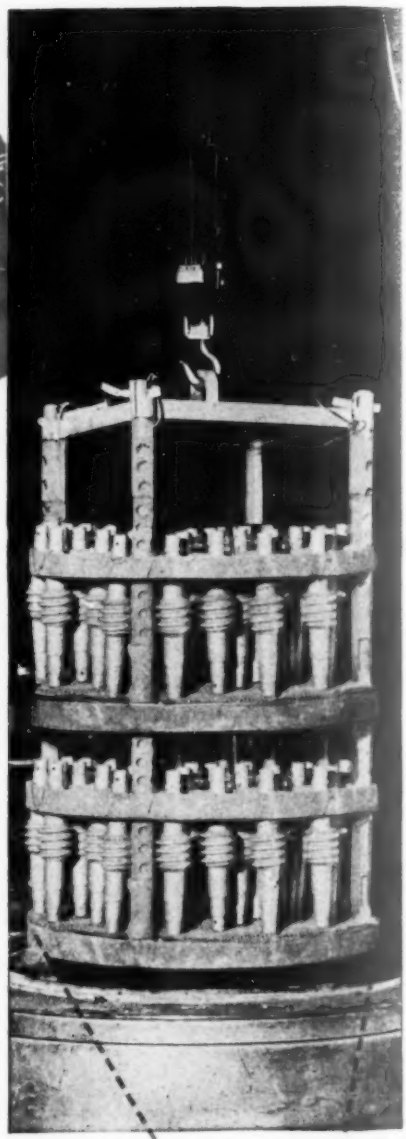
Foundry

METAL CUTTING MACHINE

Keeping ahead of trends in the processing of magnesium and aluminum castings, DeWalt introduces this specially designed machine for removing gates and risers. Completely new in foundry methods, this DeWalt puts the cleaning room *on a production schedule* and increases the efficiency of the entire foundry. Write for descriptive literature

DE WALT PRODUCTS CORPORATION

LANCASTER, PENNSYLVANIA



Saves this labor and space and TRIPLES production

Lindberg Super Cyclone Furnace

ONE TYPICAL user by handling 100 worm gears per load, *increased production 3 times.*

This great improvement is possible because the work is confined in a small area and the heat is driven through the load at high velocity. Then the entire load is quenched at once, without piece-by-piece handling.

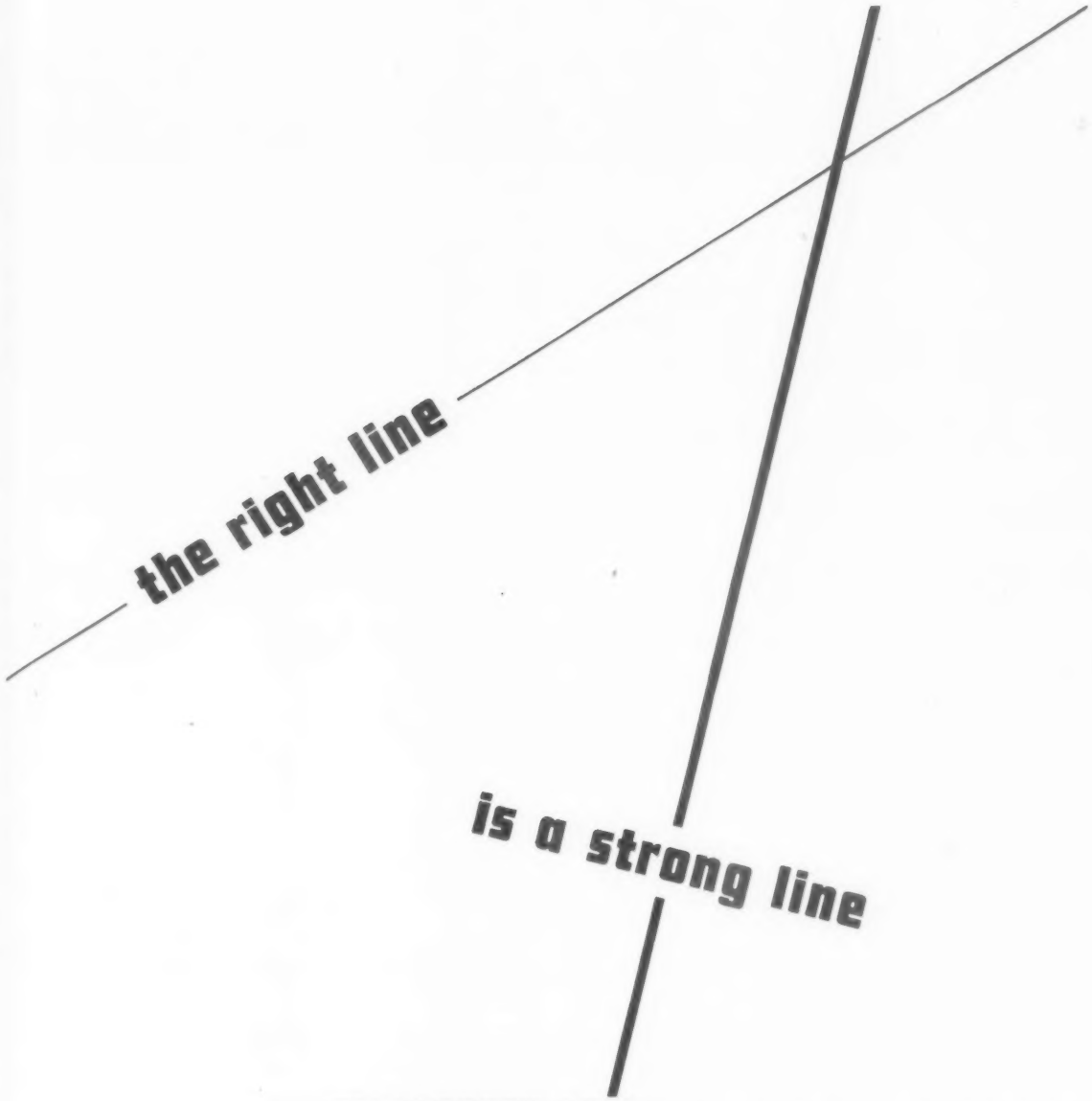
These are advantages of the principle of heating solely with fan-driven hot air which, in the Super-Cyclone, builds up temperature with rapid uniformity to as much as 1750°F. *throughout the charge.* Other advantages include keeping work straighter because there is no one-sided heat to cause distortion. Each piece and the complete mass of each piece is heated at the same rate.

And the versatile Super-Cyclone can be used for normalizing, hardening and tempering, with a temperature range from 300° to 1750°F. Lindberg furnaces can save for you too . . . write us now for complete information. Lindberg Engineering Company, 2453 W. Hubbard St., Chicago 12.

LINDBERG FURNACES

ARMY E NAVY

SUPER-CYCLONE for hardening, normalizing, annealing, tempering
CYCLONE for accurate, low-cost tempering and nitriding
HYDRYZING for scale-free and decarb-free hardening

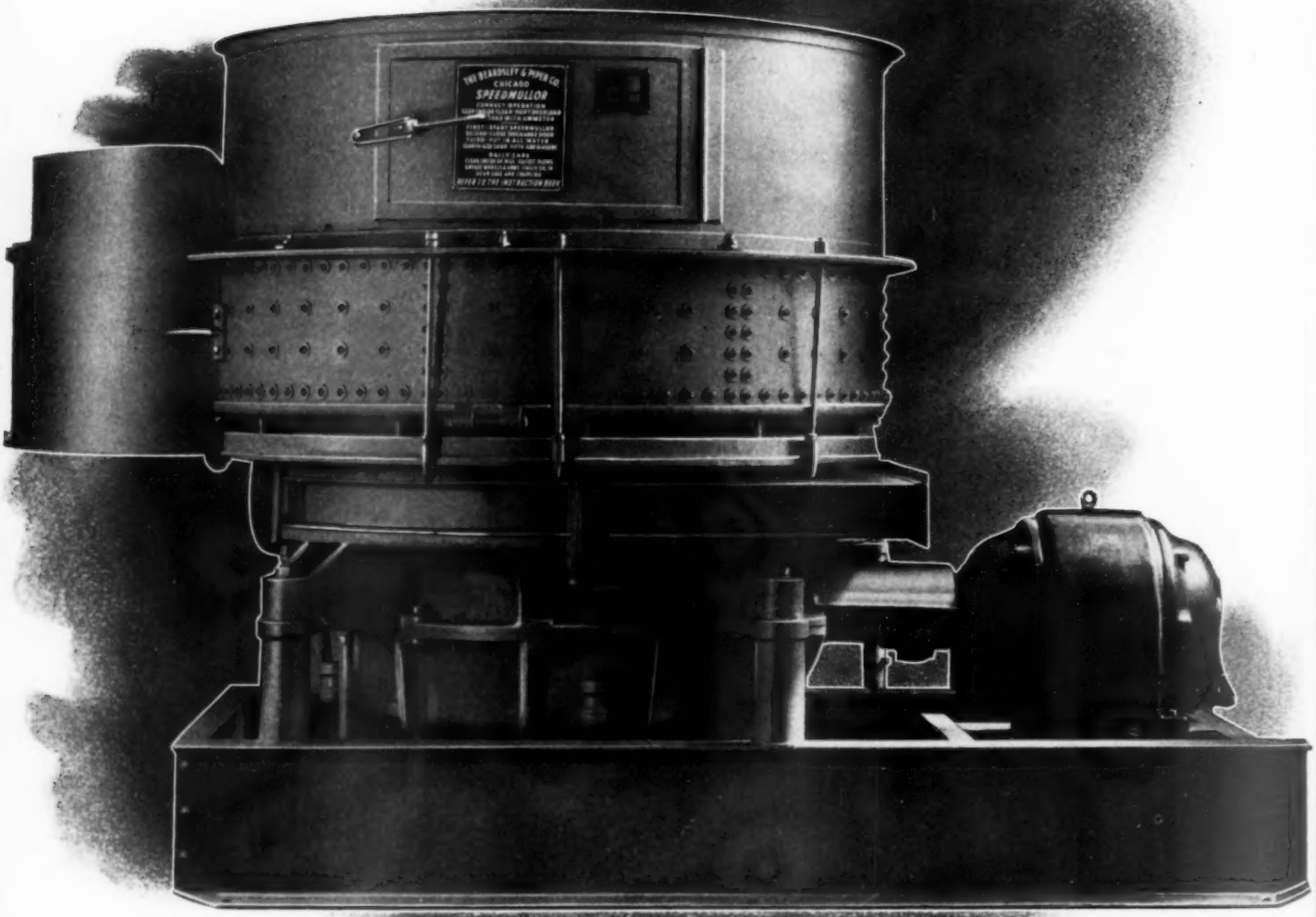


THE NORTON LINE of Refractories is based upon time-tested products plus experienced engineering. Non-ferrous foundries long have successfully used Norton Refractory Cements for (1) ramming into oil or gas fired reverberatory and pit furnaces melting aluminum; (2) for lining Ajax-Northrup high-frequency furnaces melting nickel-chromium alloys; (3) for rammed linings in Ajax-Wyatt low-frequency vertical ring induction furnaces melting high copper alloys, copper-nickel alloys, nickel-silver, and cadmium bronzes. Norton engineers will be glad to specify the correct cement for each of your applications.

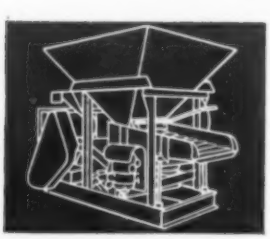
NORTON COMPANY • Worcester 6, Massachusetts

NORTON Longer Lasting **REFRACTORIES**

4½ TIMES FASTER...

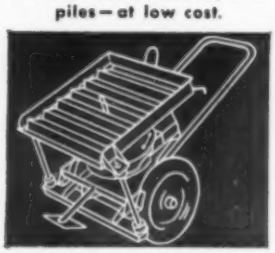


Speedmullor—model 80
—batch size 20 cu. ft.

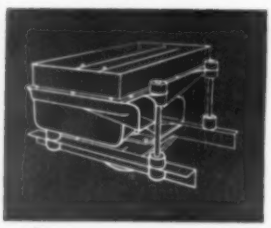


B&P Portable Sand Conditioner
—portable, low cost—an efficient machine in any foundry.

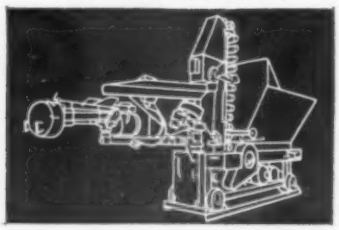
B&P Screenarator—cuts, screws, double aerates, and piles—at low cost.



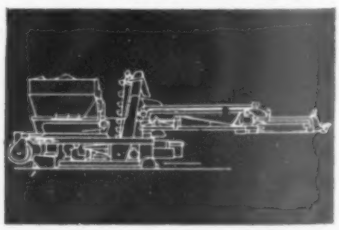
B&P Gyratory Screen—assures inproved sand conditions at maximum capacity and at lowest cost.



B&P Sandslinger—saves floor space, improves castings, lowers costs, and increases production.



B&P Speedslinger—performs the ramming labor of 50 skilled men—does a superior ramming job.



WITH THE *Speedmullor*

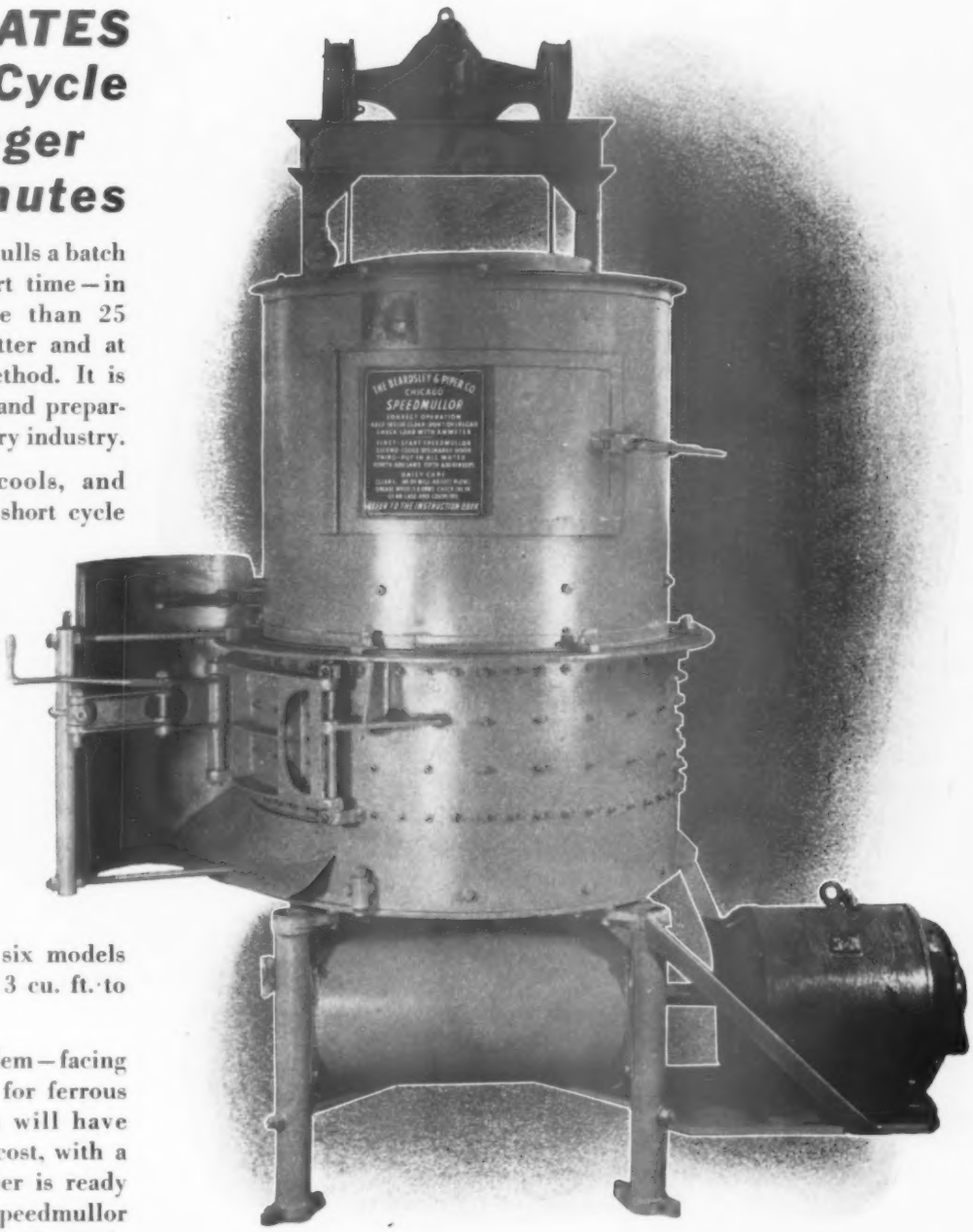
MULLS–AERATES COOLS–In a Cycle Seldom Longer Than 1½ Minutes

The Speedmullor thoroughly mulls a batch of sand in a remarkably short time—in some instances in not more than 25 seconds. It prepares sand better and at lower cost than any other method. It is the greatest advancement in sand preparation ever offered to the foundry industry.

The Speedmullor aerates, cools, and thoroughly mulls in a single short cycle which is seldom longer than 1½ min. It is economical of floor space, and requires fewer manhours per ton of sand mulled. Up to 25% less core oils and 50% less binders are used because of better and more even distribution. Sand prepared in the Speedmullor makes better molds and better castings, and it saves drying, shake-out, and cleaning time.

The Speedmullor is made in six models which range in capacity from 3 cu. ft. to 20 cu. ft. per batch.

Whatever your mulling problem—facing sand, backing sand, or cores—for ferrous or nonferrous castings—you will have better mulled sand, at lower cost, with a Speedmullor. A B&P engineer is ready to show you how to apply Speedmullor speed and savings to your specific problem—and at no obligation to you.



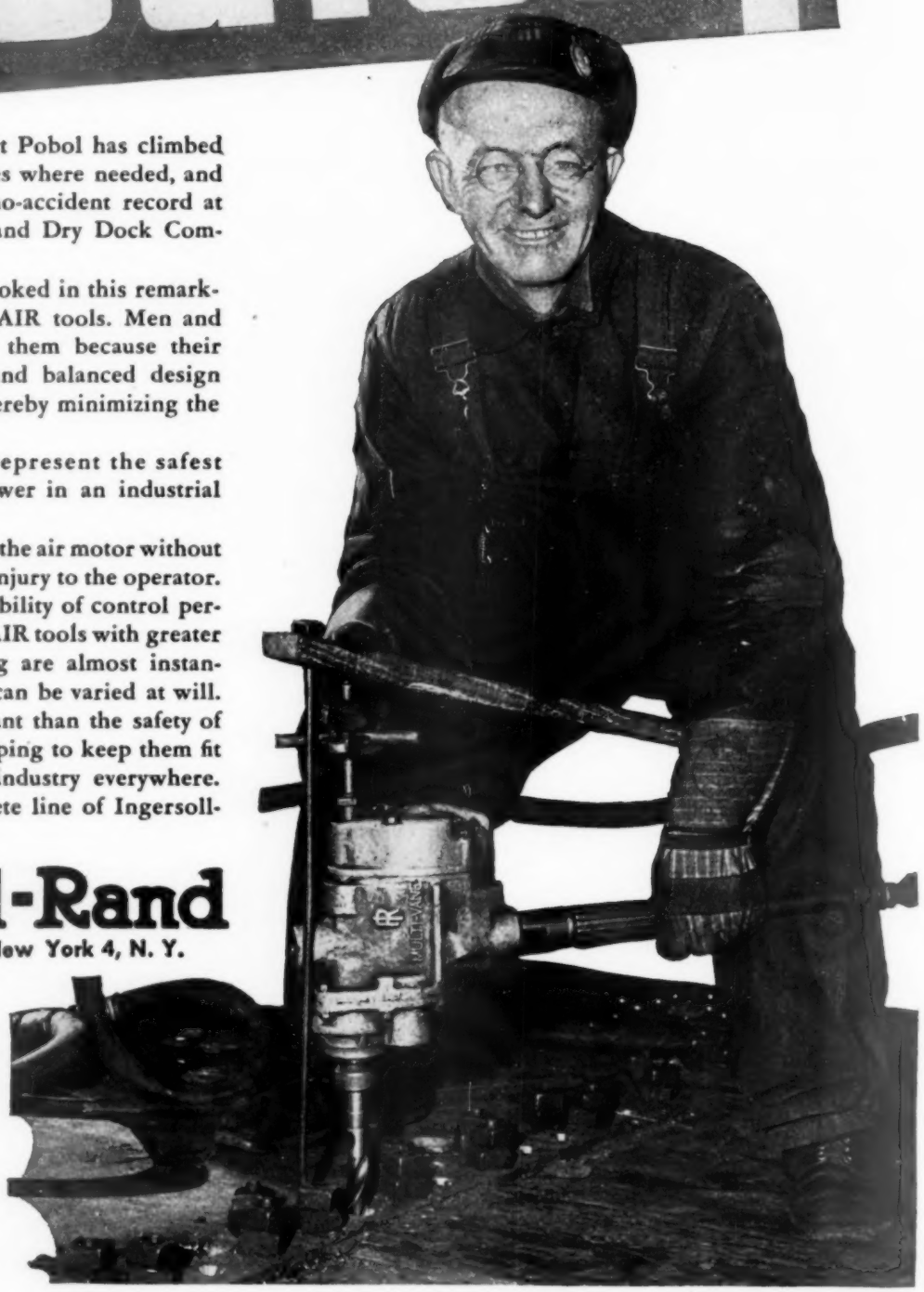
Speedmullor—model 30
—batch size 3 cu. ft.

THE BEARDSLEY & PIPER COMPANY

2541 North Keeler Avenue • • • Chicago 39, Illinois

Safety

YOU'D SMILE TOO!



For over 25 years Constant Pobol has climbed high on ships drilling holes where needed, and has maintained a perfect no-accident record at the Federal Shipbuilding and Dry Dock Company, Kearny, N. J.

A factor not to be overlooked in this remarkable record is the use of AIR tools. Men and women of industry prefer them because their light weight, small size, and balanced design reduce operator fatigue, thereby minimizing the possibility of accident.

AIR-tool power lines represent the safest method of transmitting power in an industrial plant.

Overloading merely stalls the air motor without a breakdown or a possible injury to the operator.

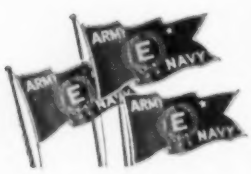
Unequalled ease and flexibility of control permit the operator to handle AIR tools with greater skill. Starting and stopping are almost instantaneous. Speed and torque can be varied at will.

Nothing is more important than the safety of workers. AIR tools are helping to keep them fit and available for duty in industry everywhere.

Choose from the complete line of Ingersoll-Rand AIR tools.

Ingersoll-Rand

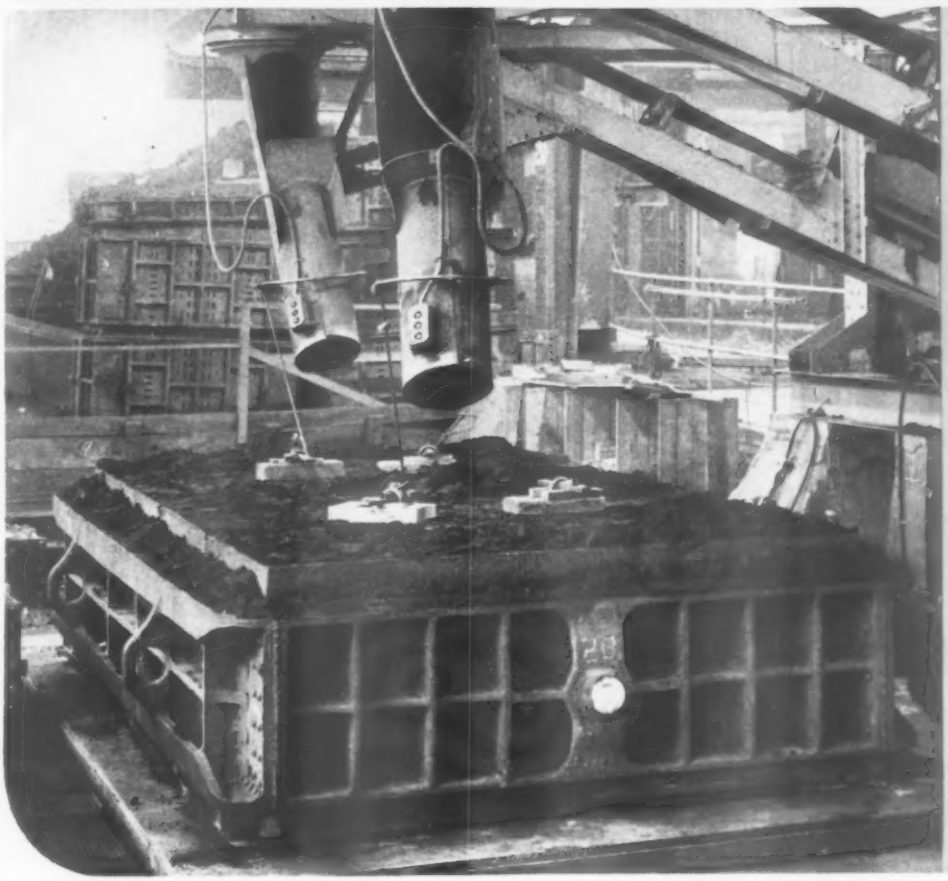
11 Broadway, New York 4, N. Y.



8-355

COMPRESSORS • TURBO-BLOWERS • ROCK DRILLS • AIR TOOLS • CENTRIFUGAL PUMPS • CONDENSERS • OIL AND GAS ENGINES

TREBLE THE PRODUCTION OF EVERY MAN?



HERE'S HOW!

The manpower shortage will not worry the foundry superintendent so much if his molding department is equipped with Herman Molding Machines and a planned and effective production layout.

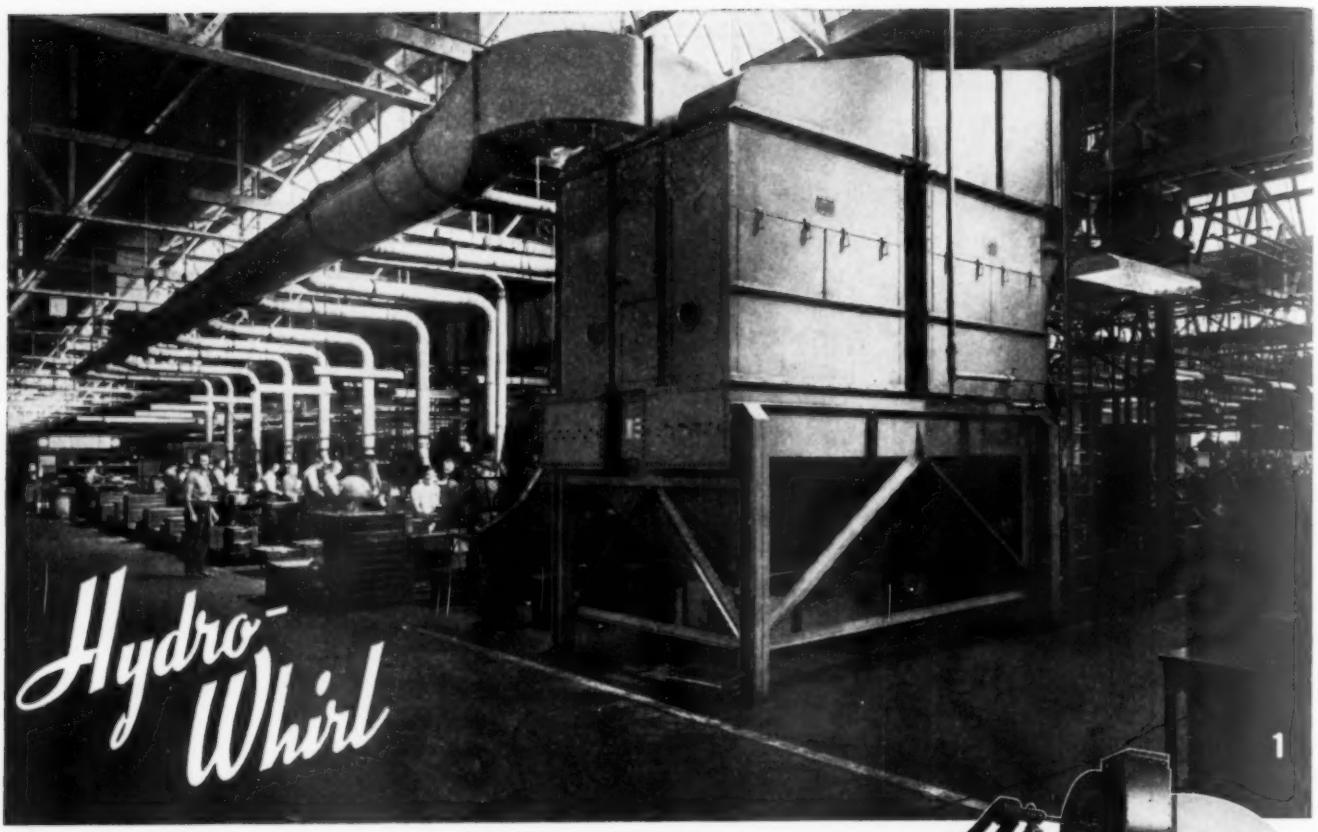
Molding production increases up to 500 per cent are not uncommon with production centered about the Herman—and all this *with less manpower.*

Herman Molding Machines make good molds fast, very fast—with a smoothness and ease that conserve power, save money, and reduce the fatigue of workers while assuring maximum operating life of equipment. Only Hermans give you *all* these features in a Molding Machine—automatic timing, rapid, rotary valve control, instant acting, adjustable air clamps, smooth hydraulic Rollover and Pattern Draw, self-locking pattern draw mechanism, *exclusive* patented Herman Rollover mechanism, power saving gravity return of rollover plate, and mold deposited directly on conveyer.

A Herman engineer will be glad to discuss your problems with you without obligation.

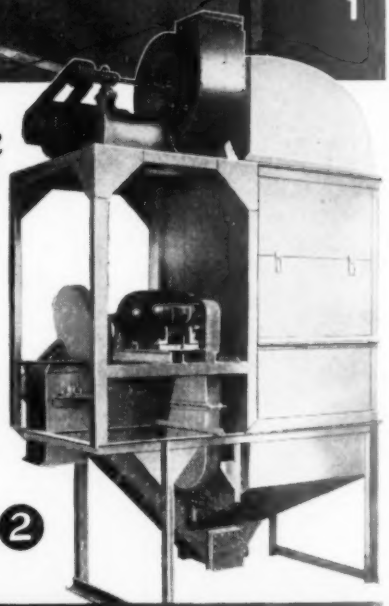
MOLDING HERMAN MACHINES

HERMAN PNEUMATIC MACHINE CO., UNION BANK BUILDING, PITTSBURGH, PA.



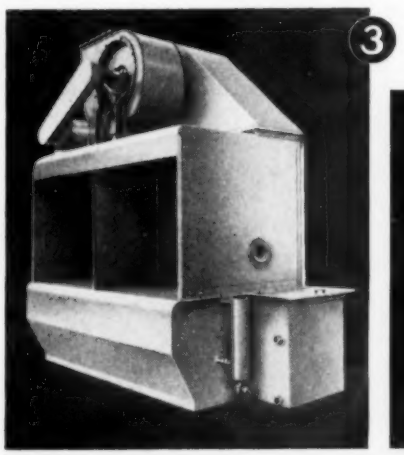
MAKES FOR GREATER *Plant Efficiency*

Whatever your requirements in dust collecting units, ventilating systems, ovens, paint spray booths, etc., Peters-Dalton, Inc. engineers—through long and varied experience—can solve the particular problems pertinent to your plant. Shown here are typical installations of Peters-Dalton, Inc. equipment designed and built to successfully meet dust control problems in all types of organizations. Feel free to call upon us—our wealth of experience, recommendations and fullest assistance are yours for the asking.



1. A Peters-Dalton, Inc. installation designed for large department devoted to double spindle grinding and polishing lathes. In foreground is a 28,000 C.F.M. Hydro-Whirl unit.
2. A rotor type 4,000 C.F.M. Hydro-Whirl designed for core sand handling.
3. Booth type Hydro-Whirl collector suited for flexible shaft grinding and burring operations. Center divider removable, making full-width single booth if desired.
4. Closeup of booth showing grinding of large magnesium parts—one of a battery of Hydro-Whirl units.

Peters-Dalton, Inc. Hydro-Whirl Collectors are accepted standard for magnesium dust collecting.



HYDRO-WHIRL

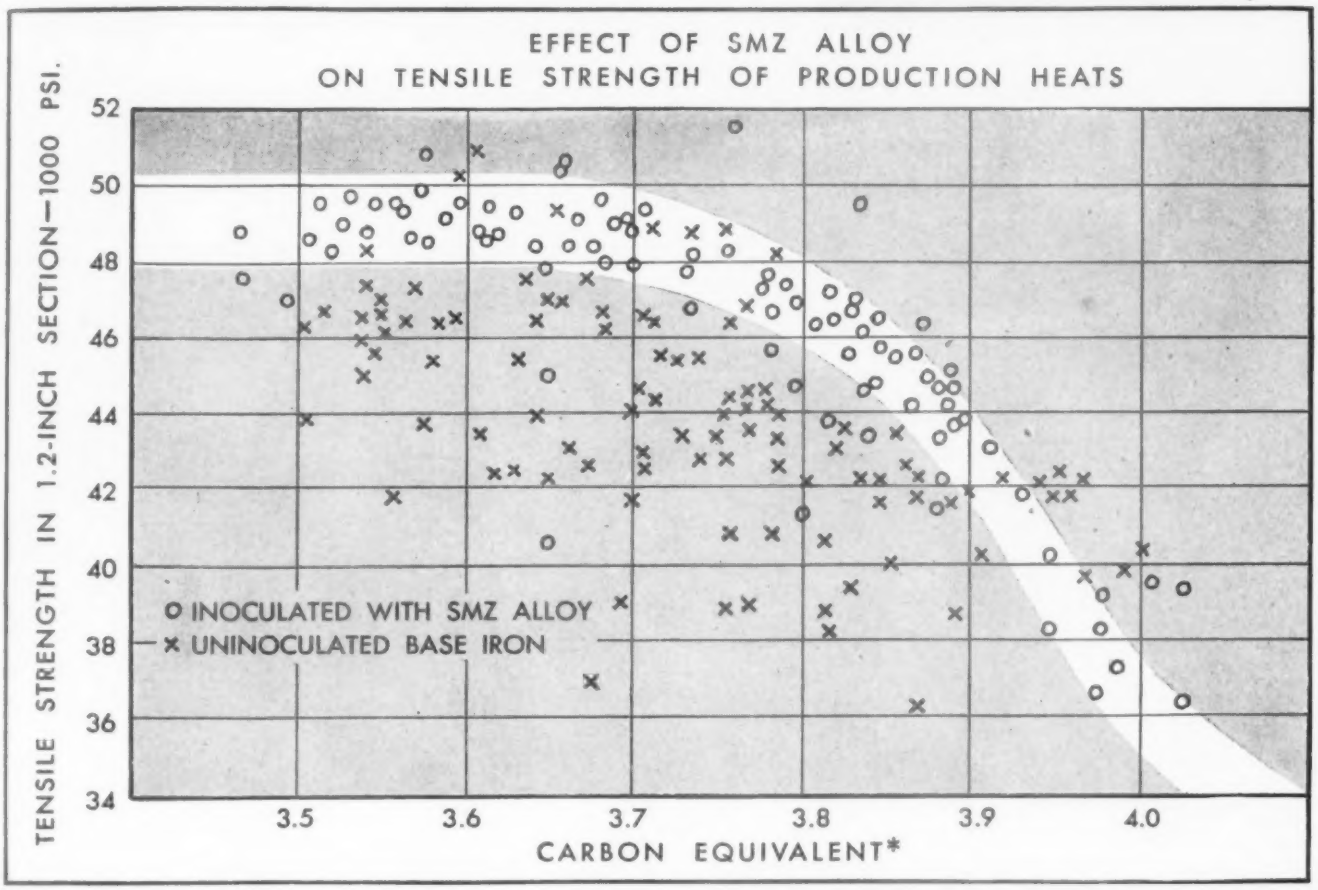
PETERS-DALTON *Incorporated*

625 EAST FOREST AVE. • DETROIT 1, MICH.

(Formerly Industrial Sheet Metal Works)

MFRS. HYDRO-WHIRL DUST COLLECTORS AND SPRAY BOOTHS—INDUSTRIAL OVENS, MECHANICAL WASHERS AND VENTILATING SYSTEMS

For Predictable Results with High-Strength Iron *Use SMZ ALLOY*



LOOK at these results on nearly 200 commercial heats in a big production foundry. Notice how 69 out of the 91 SMZ-treated heats fell within a tensile strength range of 2,500 pounds per square inch, (light area) and were consistently higher in strength than the untreated irons.

An average ladle addition of 0.35 per cent silicon as SMZ Alloy made the difference, for the comparisons are between irons of the same carbon equivalent.* The SMZ Alloy addition not only gave higher strength but also gave a softer, more machinable iron.

Foundrymen now have an economical way of getting the machinable high-strength irons they need for high-quality castings.

BUY UNITED STATES WAR BONDS AND STAMPS

The unshaded area covering a tensile strength range of 2,500 pounds per square inch takes in over 75 per cent of the SMZ-treated heats.

*"Carbon equivalent" expresses in terms of carbon the total effect of carbon, silicon, and phosphorus on the properties of cast iron and is calculated by adding 3/10 of the silicon and the phosphorus contents to the carbon content. For example, an iron containing 3.20% carbon, 1.80% silicon and 0.20% phosphorus, would have a carbon equivalent of 3.80.

FOUNDRYMEN

You can get more information on SMZ Alloy from the book "SMZ Alloy and Its Uses As a Ladle Addition to Cast Iron." Write for your copy today.

The registered trade-marks, "Electromet" and "SMZ," distinguish products of Electro Metallurgical Company.

ELECTRO METALLURGICAL COMPANY
Unit of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
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Electromet
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Carl-Mayer Achievements March On!

Outstanding Vertical Oven Installation at General Steel Castings Corp.

PATENT NO.
2,257,180

Dimensions (each oven)—67′0″ top to bottom x 11′2″ x 20′0″ cross section.
Load per carrier—5 tons.
Load per oven—80 tons per bake, maximum.
Gas Fired Recirculating Air Heater Principle; fully automatic.
Semi-automatic loading; automatic unloading.

OTHER CARL-MAYER VERTICAL OVEN INSTALLATIONS FOR CONCERNS SUCH AS - -

- Aluminum Co. of America
- Cadillac Motor Co.
- Eclipse Aviation Corp.
- Electric Autolite Co.
- Ford Motor Co.
- Fremont Foundry Co.
- General Motors Corp.
- General Steel Castings Corp.
- Harrison Radiator Corp.
- Packard Motor Co.

● **The ability of Carl-Mayer Engineers to meet the core-baking needs of nationally prominent foundries under war-time pressure—and do it efficiently and economically, is the ability to create that more and more industrial leaders are certain to recognize as most valuable in the keenly competitive post-war market.** ***Write or wire for Carl-Mayer recommendations on your individual baking problems.***

THE CARL-MAYER CORPORATION
3030 Euclid Ave. Cleveland, O.

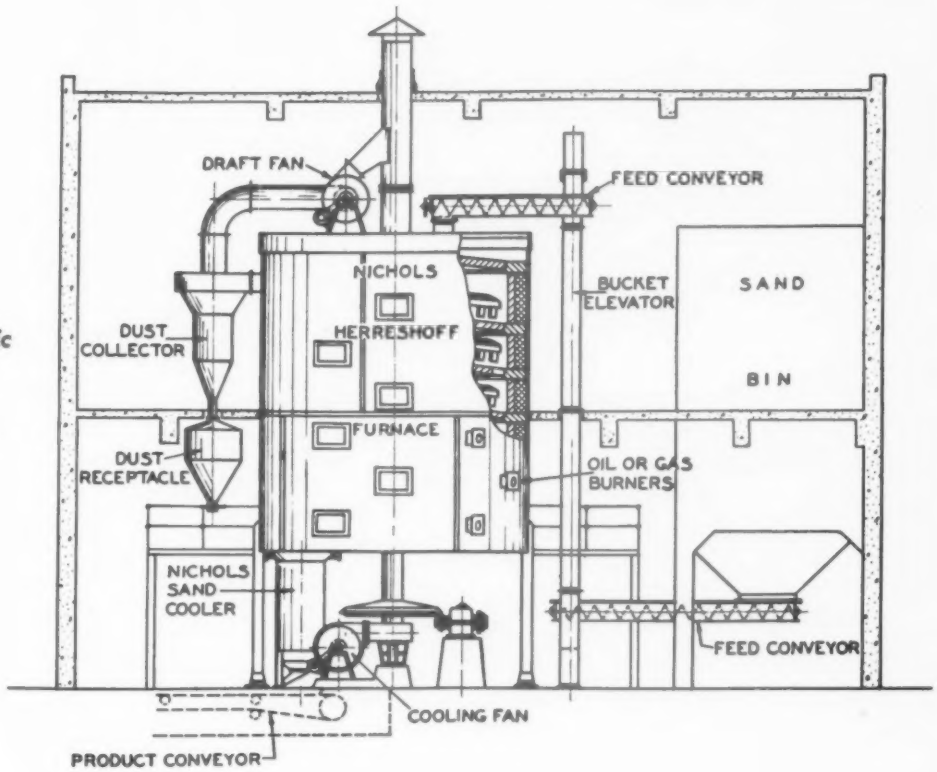
Core and Mold Ovens

ALL TYPES . . . ALL SIZES

Reclaim Foundry Core Sand

The Nichols Way—As Always

SIMPLE . . . ECONOMICAL . . . DEPENDABLE



Typical diagrammatic layout of Nichols Sand Reclaiming System

Nichols Herreshoff Multiple Hearth Furnaces are producing reclaimed, clean, uniformly sized core sand, as needed by industry, at substantial savings.

"The Nichols Way" of reclaiming foundry core sand provides a complete system for conveying, thermal processing, cooling and dust collecting.

Nichols equipment conserves floor space, requires a minimum of attention and provides for close control of time and temperature for the continuous production of "like new sand."

Designs incorporating the well-known Nichols Herreshoff Multiple Hearth Furnace are available in a wide range of sizes to handle large or small tonnage depending on individual foundry requirements.

Contact a Nichols engineer today and check with him regarding the savings to be made through reclamation of foundry core sand this *simple, economical,* and *dependable* way.

NICHOLS ENGINEERING & RESEARCH CORPORATION

60 WALL TOWER BLDG., NEW YORK 5, N. Y. NERCO UNIVERSITY TOWER BLDG., MONTREAL, P. Q.

FROM BOILER to "Belly Bubble"

SECONDARY ALUMINUM TAKES TO THE AIR!

One device that plays a mighty important part in getting our Fortresses there and back—safely, is the inconspicuous but deadly little "belly bubble" or power-controlled lower gun turret on the underside of our bombing planes.

Precision-built, it is essential that its constituent metals be above reproach in quality. That is why we're proud that Federated aluminum is contributing to the fabrication of these little Axis eradicators—and also for parts of guns, tanks, planes and many other vital units of our war machine.

Today, thanks to meticulous control plus advances in metallurgical processes, secondary aluminum ingot is comparable in quality to the best of aluminum. Federated aluminum will meet your requirements.

Consulting service available through your nearest Federated office.

PRODUCTS PRODUCED BY FEDERATED METALS

ALUMINUM
BRASS
BRONZE
DIE CAST ALLOYS
SOLDER
BABBITT
TYPE METAL
ZINC DUST

All of these in all commercial forms—Special Alloys to your specifications.

FMD

Federated

METALS DIVISION

AMERICAN SMELTING and REFINING COMPANY

120 BROADWAY, NEW YORK (5) N. Y.

Nation-wide service with offices in principal cities

Why Let Sand Be A Problem?

It's as simple as this. There are certain conditions a molding sand must embody if the castings are to be sound and smooth, and if cleaning time and discount are to be minimized. The sand must be free of refuse and lumps, completely blended and mixed with moisture evenly distributed and have adequate aeration to provide permeability.

This "Six Point" Sand Conditioning is provided only by the Royer Sand Separator and Blender. Regardless of the condition of the heap sand that is shoveled into a Royer, it comes out cooled, open, thoroughly mixed and refuse-free —the kind of sand that eliminates skids, run-outs, and drops. Royerized sand, which is produced with minimum manpower, results in smoother castings and less cleaning time. Discount losses are cut sharply because the defects caused by poorly conditioned sand are completely eliminated.

Over 5,000 Royers are in use today. You will find them in the foundries with outstanding war production records. There's a stationary or portable model to meet the needs of every foundry — ferrous or nonferrous — production or jobbing. Special units for the sand conditioning systems of production foundries.

Take the first step in terminating your sand conditioning problem by writing for full particulars on the Royer.

He's Only an Ant, but he Knows his Sand

The ant chooses the site of his home with proper care. The sand must have the right moisture content and consistency — so there will be no cave-ins. But the ant's sand problem is simple and, being a wise creature, he makes no mistakes.

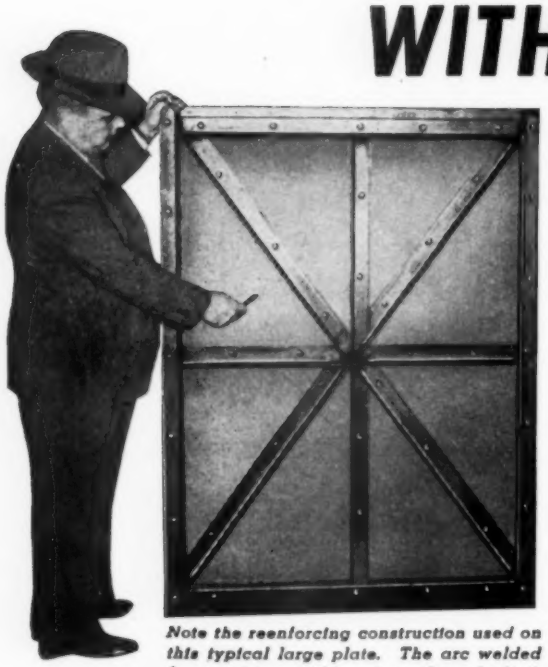
In the foundry, "Six Point" Sand Conditioning is essential.

Royer Model "R" stationary sand conditioner with a capacity of 40 to 50 tons per hour at the Pottsville Castings & Machine Shops, Inc., Pottsville, Pa.

THE ROYER FOUNDRY & MACHINE CO.
KINGSTON, PENNSYLVANIA

FOREMOST IN SAND CONDITIONING EQUIPMENT

CARRY CORES UP TO 1200 LBS. WITHOUT DEFLECTION!



Note the reenforcing construction used on this typical large plate. The arc welded frame gives rigidity, strength and elimfnates deflection.

IT IS BEING DONE ON DIAMOND REENFORCED STEEL CORE PLATES

These special core plates are designed to carry large cores up to 1200 lbs., cores of any size, without deflection or warping.

You may obtain Diamond Core Plates to suit your own special requirements. They are furnished with or without perforations and in all smaller, standard sizes—plain or reenforced as indicated by your needs.

Send us detailed information on your core baking problem and we'll be glad to design a plate to handle the job. Weight of core and dimensions, in particular.

DIAMOND

CLAMP AND FLASK COMPANY

Telephone 2553 **Richmond, Indiana**

Designers of CORE PLATES, JACKETS, BANDS, FLASKS since 1889

MAEHLER CORE OVENS

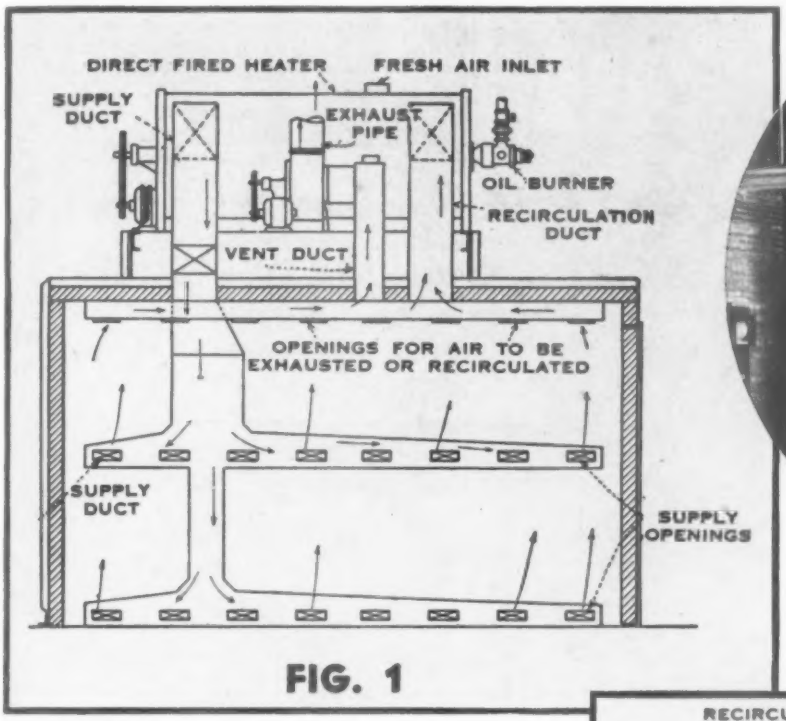


FIG. 1

• *Above — Maehler Lift Door Core Oven at American Brake Shoe & Foundry Company*

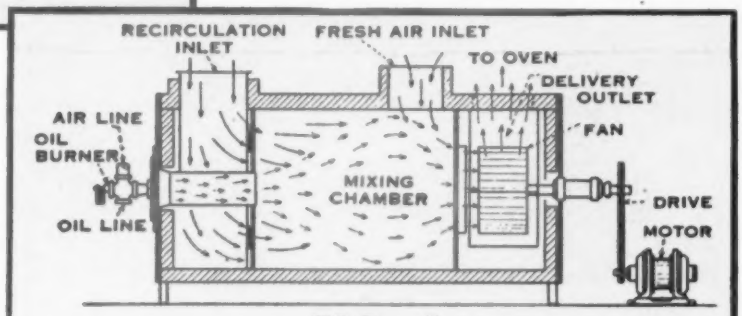


FIG. 2

. . . help eliminate under-baked and over-baked cores

MAEHLER builds a complete line of re-circulating air-heat metal core ovens and conversion units for old ovens that perfectly bake every core — large or small, thin or heavy. This equipment is oil-fired, gas-fired or electrically heated.

Maehler originated and perfected the re-circulating air-heat system whereby air from a heater is circulated through the core oven and back to the heater as illustrated in Figure 2. Figure 1 shows how this air is distributed throughout the oven chamber to provide very uniform baking of cores — a vast improvement over old ovens not employing this system.

Maehler air-heat core ovens reduce baking time, give greater output in less space, produce more evenly baked cores, eliminate smokiness and cost less to operate than previous types of ovens.

THE PAUL MAEHLER COMPANY
2200 W. Lake Street • Chicago 12, Ill.

FOR FULL DETAILS, write to Maehler for engineering data and case studies.

A FEW TYPICAL USERS OF MAEHLER EQUIPMENT

Advance Aluminum Castings Corp.
Phelps Dodge Corporation
Bohn Aluminum & Brass Corp.
Magnesium Fabricators
Packard Motor Car Co.
Revere Copper & Brass
Ebaloy Foundries
General Motors Corp.
Sargent & Greenleaf
Howard Foundries
Extruded Metals Corporation

MAEHLER

Industrial Ovens and Furnaces for Core Baking, Mold Drying, Heat Treating, Enameling, Etc.

The CLEARFIELD 900 SERIES

SHORT MIXING CYCLE

IMPROVED MOLDS

MINIMUM REJECTS

Ideal

FOR EITHER BATCH OR CONTINUOUS HANDLING SYSTEMS

If you need top capacity, investigate these big Clearfields whose high production and operating economies are being demonstrated daily by major steel, iron, and magnesium castings producers, such as Ford Motor Company, U. S. Steel Corporation, Jones & Laughlin, Inland Steel, American Steel Foundries, Michigan Light Alloys, Burd Piston Ring, General Motors, Bendix Aviation, Ingersoll-Rand, U. S. Radiator, National Radiator, Crouse-Hinds, Atlas Steel Castings, Symington-Gould, Atlantic Foundry, Humphryes Manufacturing, National Malleable, Pittsburgh Steel Foundries, United Engineering & Foundry, Marshall Stove, and a host of others.

Let our engineers show you what the CLEARFIELD will do on YOUR work!

CLEARFIELD MACHINE COMPANY

CLEARFIELD
PENNSYLVANIA, U. S. A.

Your inquiry is invited. If you desire a definite proposal, please state quantity and type of sand to be conditioned and characteristics of available electric current.

ALUMINUM LIVES TO FIGHT AGAIN!

• Rigid are the demands of war production and aluminum's part grows more important with every passing day.

The amazing thing is the way aluminum is being re-enlisted in this war effort.

Take for example, this wrecked plane. The aluminum reborn from its twisted and scarred wreckage is reincarnated into the vital parts of our new modern tanks.

And what's more . . . there are hundreds of other applications for this reborn aluminum. The exactness with which this aluminum can be realloyed to meet the most rigid of wartime specifications is a tribute to American science and ingenuity.

Aluminum alloys, as produced by the members of the Aluminum Research Institute, are being re-enlisted every day . . . living to fight again against our enemy . . . playing an important role in the production program that will help hasten Victory.

Aluminum and Magnesium, Inc.
Sandusky, Ohio

The American Metal Company, Limited
New York City

Apex Smelting Co.
Chicago, Illinois

The Cleveland Electro Metals Co.
Cleveland, Ohio

Federated Metals Division American Smelting and Refining Company
New York City and Branches

General Smelting Company
Philadelphia, Pennsylvania

William F. Jobbins, Inc.
Aurora, Illinois

R. Lavin & Sons, Inc.
Chicago, Illinois

The National Smelting Company
Cleveland, Ohio

Niagara Falls Smelting & Refining Corp.
Buffalo, New York

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Kansas City, Kansas

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East Chicago, Indiana

ALUMINUM RESEARCH INSTITUTE

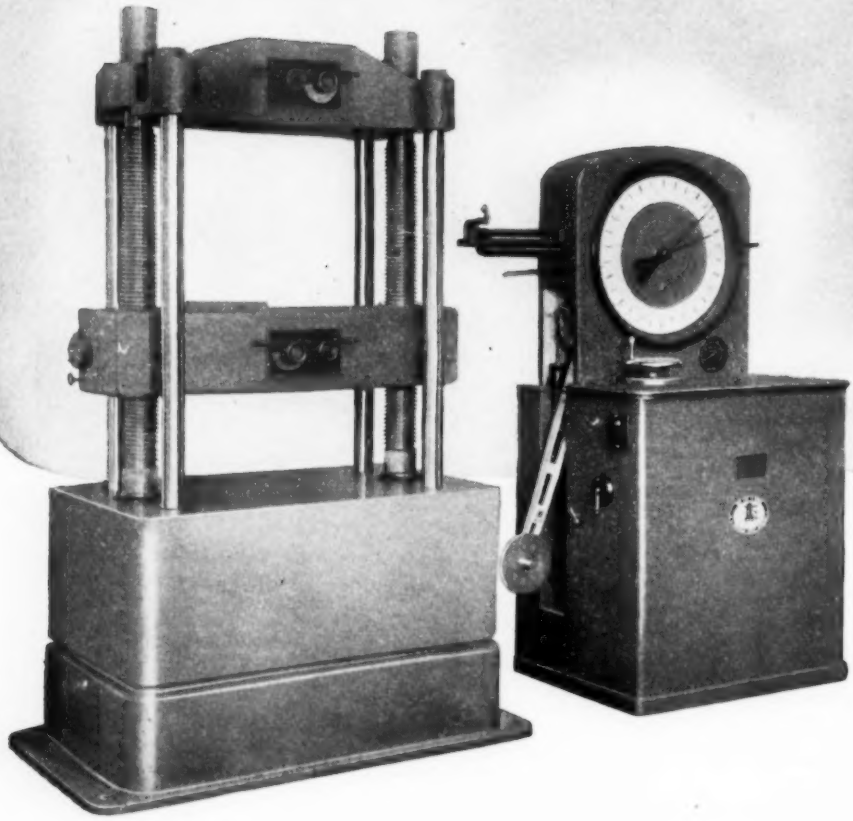
111 West Washington Street, Chicago 2, Illinois

PRECISION HYDRAULIC TESTING MACHINE

with Pendulum Load Indication

MORE ACCURATE, MORE DEPENDABLE FOR PRODUCTION TESTING ***because:***

Pendulum load indicator operates on the natural laws of gravitation. ...This principle of operation is not affected by temperature changes or subject to metal fatigue.... *Write for descriptive literature and quotations.*



RIEHLE

TESTING MACHINES

Division of

AMERICAN MACHINE AND METALS, INC.

East Moline, Illinois

Other Products: IMPACT TESTERS • VICKERS HARDNESS MACHINES • BRINELL HARDNESS TESTERS • MEASURING INSTRUMENTS

AN ~~AXE~~ AXIS TO GRIND

WAR challenged the Abrasive Industry with a big part in a big job — helping grind down the Axis!

Abrasive Company Grinding Wheels have been answering that challenge. The experience has been a fruitful one. To half a century of skill have been added new ideas, new methods, new advances.

Today, Abrasive Company "grinds" at top speed to finish this war job. Tomorrow, "Abrasive" will be more than ever able to serve American Industry with abrasive products whose Password is PERFORMANCE, whose Watchword is DEPENDABILITY and whose Buyword is long-run ECONOMY.

"COMMANDING QUALITY ★ OUTSTANDING RESULTS"

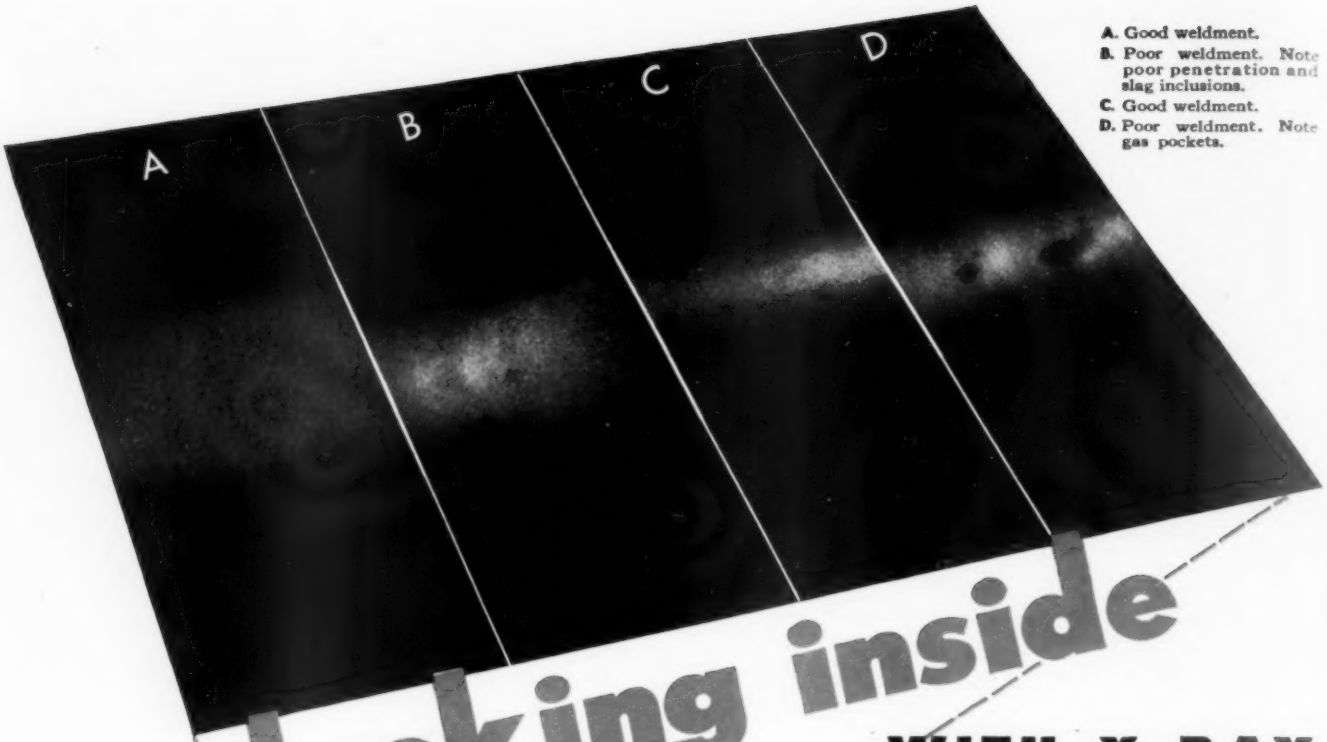
ABRASIVE

ABRASIVE COMPANY

DIVISION OF SIMONDS SAW AND STEEL CO.

TACONY & FRALEY STS., PHILADELPHIA, PA. • CHICAGO BRANCH: 127 SOUTH GREEN ST.

DISTRIBUTORS IN ALL PRINCIPAL CITIES



A. Good weldment.
B. Poor weldment. Note poor penetration and slag inclusions.
C. Good weldment.
D. Poor weldment. Note gas pockets.

looking inside WITH X-RAY

HELPS TRAINEES "CATCH ON" QUICKER!

They can SEE the difference between a good weld and a bad one

X-ray rules out guesswork in training, qualifying or classifying welders—or other workers—according to actual ability. It puts these all-important functions on a factual basis. For radiographs clarify . . . provide absolute proof . . . are readily understood because they *show* internal conditions that words fail to describe adequately.

They let the worker *look inside* the weldment, casting or assembly . . . show him whether it's good or bad . . . show him what to do and what to avoid. He "catches on" quicker, adheres to good, sound methods, and becomes a faster, more efficient producer from the start.

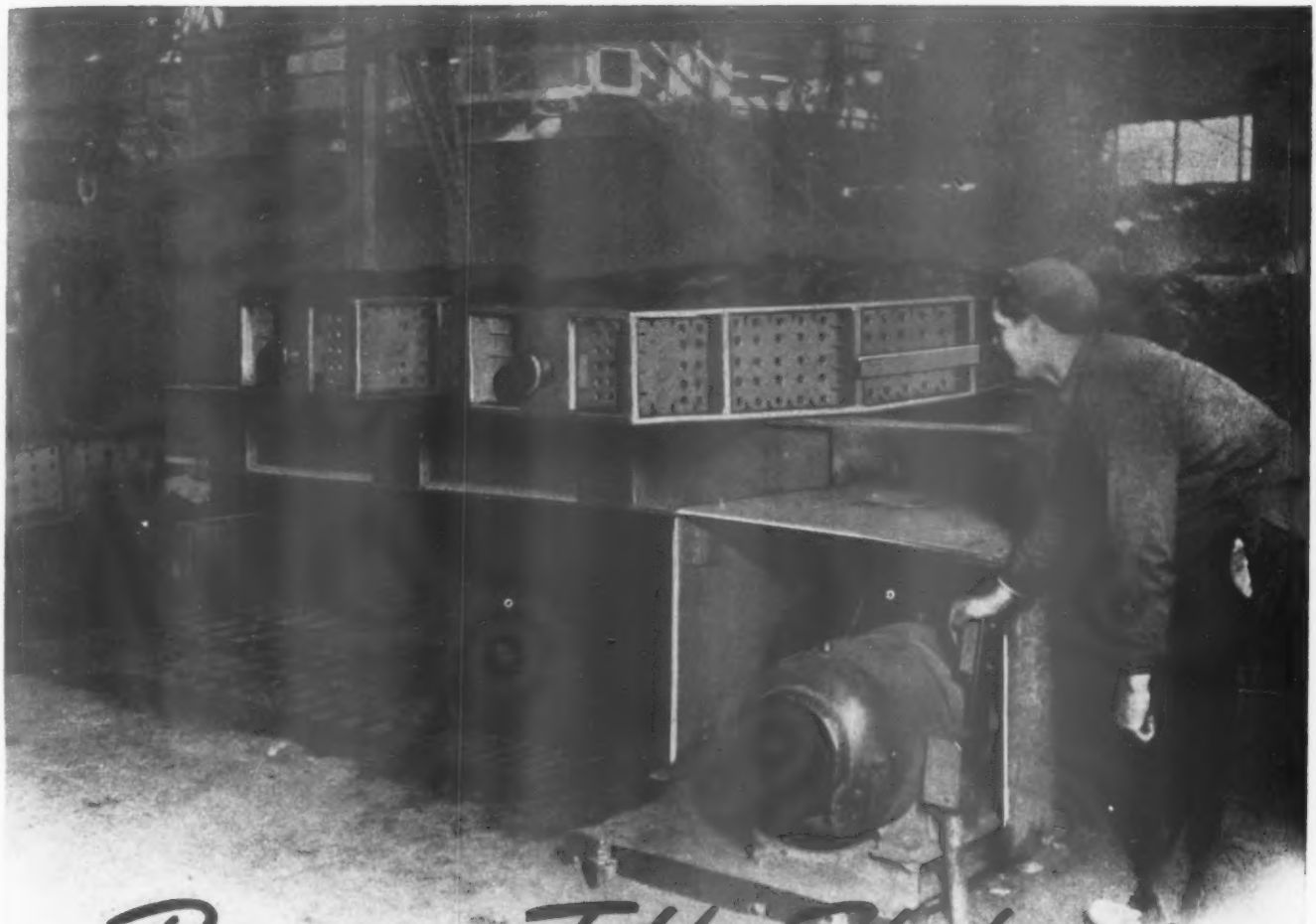
In addition to shortening training time and putting worker-classification on a factual basis, Westinghouse Industrial X-ray is doing countless other jobs faster, better and more economically. These fall into such major classifications as speeding production, saving machine and man-hours, conserving critical materials and improving quality.

For more information, write for Booklet B-3159. It suggests how and where you can benefit by using industrial x-ray. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., Dept. 7-N. J-02025

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

Industrial X-RAY



Bumping Table Shakeouts

in sizes for practically any flask

The Bumping Table Shakeout, a typical installation of which in a large steel foundry shaking out two 5000 lb. 10 ft. flasks as shown above—is an exceedingly efficient unit and can be furnished in sizes for handling large, medium and quite small flasks.

The tables of these units are mounted over collecting hoppers. One end of the table is hinged to a rigid support—the other rests on motor-driven cams that produce a thorough bumping effect.

In addition to Bumping Table Shakeouts, we are in a position to furnish shakeouts consisting of a perforated plate or heavy wire mesh screen mounted on a vibrating frame, vibrating bail and various special shakeouts—air operated mold pushers and pullers that simplify the moving of heavy flasks from mold conveyors to shakeouts,—and all required dust collecting hoods and duct work.

Our recently issued 40-page Foundry Bulletin No. 91 illustrates many different shakeouts and other Bartlett-Snow foundry equipment . . . Send for a copy!

THE C. O. BARTLETT & SNOW CO.

6201 HARVARD AVENUE • CLEVELAND, OHIO

Engineering and Sales Representatives in the Principal Cities

FOUNDRY SAND, MOLD AND CASTINGS HANDLING • • DUST AND FUME CONTROL SYSTEMS • •

Buehler

means precision in

METALLURGICAL TESTING EQUIPMENT

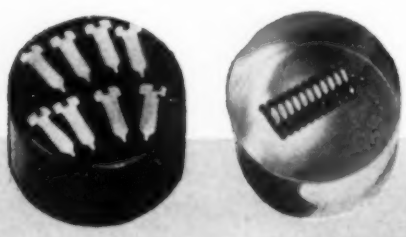
"Buehler equipment is made finer than might be considered absolutely necessary for laboratory work, but it certainly is a pleasure to use it." This remark made by a well known metallurgist is typical of the opinion throughout the field where Buehler testing equipment is used. If you use Buehler equipment you have the best

A complete line of equipment for specimen preparation

Cut-Off Machines - Specimen Mount Presses
Power Grinders - Emery Paper Grinders
Hand Grinders - Belt Surfacers - Polishers
Polishing Cloths - Polishing Abrasives

STANDARD POLISHER NO. 1500

Accurately polished specimens can be produced with speed and ease with Buehler polishers. The sturdy construction and vibrationless operation help to prevent pitting and amorphous film. The 8" polishing disc is attached to a tapered arbor on the motor shaft by means of a stout sleeve. This construction feature reduces peripheral vibration to a minimum. The standard polisher is a complete unit with a direct mounted ¼ h.p. radial thrust ball bearing motor. 115V., 60 cycle, AC, single phase, with selective speeds 575 and 1150 r.p.m. controlled by a mounted switch with handy lever.



Buehler Ltd.

A PARTNERSHIP

METALLURGICAL APPARATUS

165 West Wacker Drive, Chicago 1, Illinois

When the Blackout is lifted . . .

When the war ends and the world returns to peace-time pursuits, the vast stream of Aluminum Alloy Ingot now going forth from the plants of Aluminum Refiners to make war materiel, will be diverted to the making of motor cars, trucks, refrigerators, radios and other consumer products. This enormous volume will supply your every need for aluminum alloys to the most rigid specifications.

ALUMINUM REFINERS

Division of

BOHN ALUMINUM & BRASS CORPORATION

General Offices: Lafayette Building • Detroit, Michigan

MANUFACTURERS OF ALL TYPES AND SHAPES
OF CASTING AND DEOXIDIZING ALLOYS

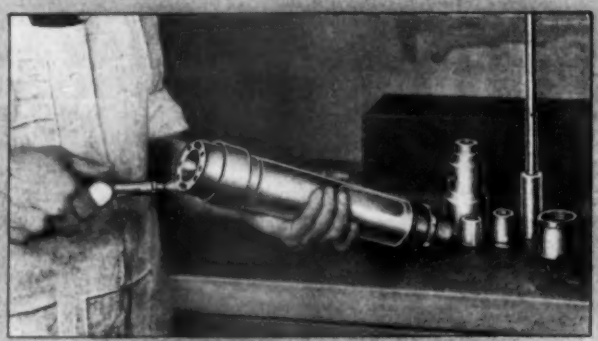
Clean and Oil YOUR SAND RAMMERS FOR Long Trouble-Free Service

Sturdy construction, the protection of all working parts, and a built-in lubricator in pipe extension assure the long life and minimum upkeep of CP Sand Rammers. Their easy control of speed and impact produces firmer, more uniform ramming that enables them to quickly earn their cost in saved time and labor. » » But to perform at their best, CP Backfill Tampers should be cared for. Take them apart and clean and oil them regularly.

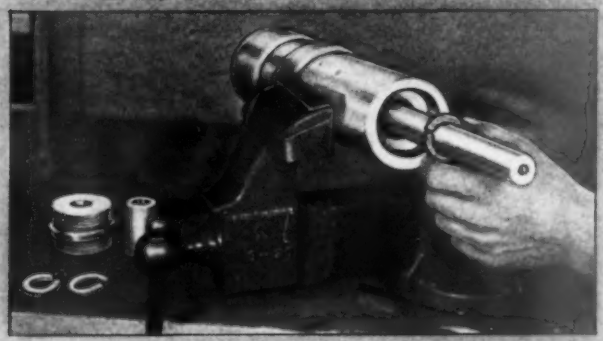
HOW TO GET MAXIMUM SERVICE FROM YOUR CP SAND RAMMERS

1 Proper way to remove head in order to clean parts — clamp firmly in vise by the flats.

2 Clean parts in kerosene or light oil. They should be well lubricated during reassembly.



3 After parts are washed and flushed in kerosene, they should be blown dry with air jet.



4 Apply packing rings one at a time, staggered. As one ring wears out another can be added.

★★★★★★★★★

PNEUMATIC TOOLS
ELECTRIC TOOLS
(Hicycle...Universal)
ROCK DRILLS

CHICAGO PNEUMATIC
TOOL CP COMPANY
General Offices: 8 East 44th Street, New York 17, N. Y.

★★★★★★★★★

AIR COMPRESSORS
VACUUM PUMPS
DIESEL ENGINES
AVIATION ACCESSORIES

WE HAVE PREPARED A MOLD FOR *VICTORY*

with *BIGGER and BETTER* FACILITIES

PARASPRAY

CORE-MOLD COATING

A WAR-TIME FOUNDRY NEED

That will set a peace-time pace

Although we didn't plan it exactly that way, there must have been more than just coincidence in the fact that our new production facilities went into action on December 7th, 1943, on the anniversary of Pearl Harbor. **THESE EXPANDED FACILITIES GIVE US MORE THAN FOUR TIMES OUR FORMER PRODUCTION OF PARASPRAY.** Of course, these are being devoted to speeding up Airplane engine production now, but after the war they will speed up foundry practice in all lines of industry.

WHAT THREE LARGEST FOUNDERS SAY ABOUT *PARASPRAY*

"Our experience shows us that we save in man power about 72 men per 1,000 heads costs and $1.182 per head!"

★

"Welds in Rocker boxes have dropped to less than 2% and leaks in the same area on water test at 60 lbs. pressure to less than 3/10%."

★

"Effect an 8% saving in time and space in core making. Reduction of 25% in labor in melting and pouring unit. Has resulted in general improved quality."

EARNING IN WAR-TIME PRODUCTION A PLACE IN YOUR POST-WAR PLANNING

Paraspray practically eliminates trouble from gas holes or porosity in castings . . . reduces costs . . . greatly increases output and improves quality astonishingly.

PARASPRAY CORES MOLDS

PARASET CORE BINDER

PARACOAT FOR PATTERNS

Sole licensees under the Saeger Patents exclusively regulating the use of rubber compounds in making and spraying cores and molds.

FOUNDRY RUBBER COMPOUNDS CORP.

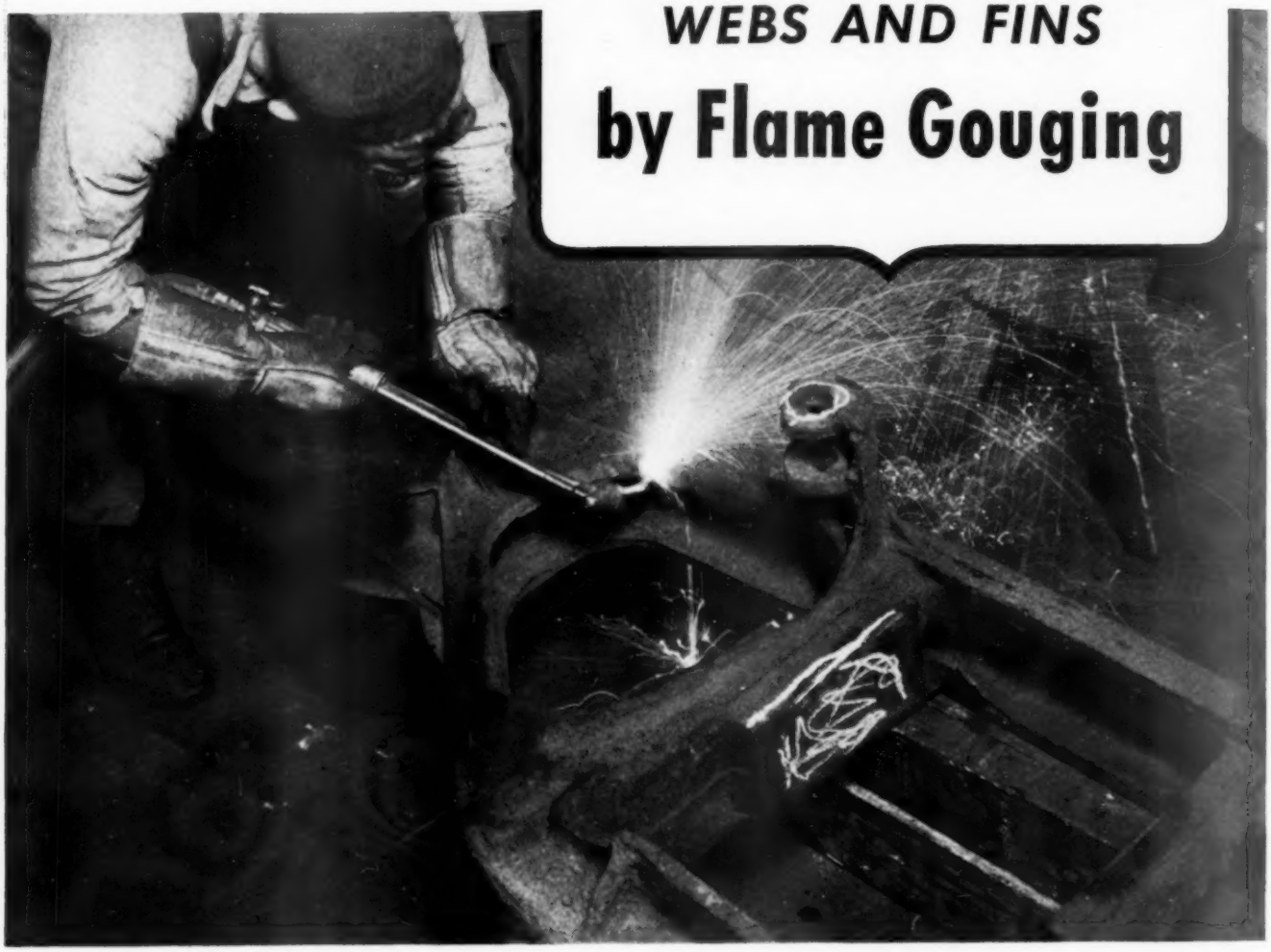
1050 30th Street, N. W. Washington 7, D. C.

Copy't 1943 . . . FRCC

EFFECTIVE REMOVAL OF SURFACE DEFECTS...

WEBS AND FINS

by Flame Gouging



Flame gouging permits speedy and thorough removal of surface flaws and cracks in castings. It cannot cover up defects which should be removed, and which, when inadvertently concealed, not only lower the quality of the finished casting but also may be a potential hazard during its use.

In removing webs and fins, flame gouging permits remarkably fast working speeds. For example one web-removing job that formerly required 2½ days is now performed in 45 minutes by this method. In addition flame gouging does a neater, more efficient job than was possible with former procedures.

Standard Airco Cutting Torches Series 9000 and 3000 are preferred by foundries for flame-gouging operations. Airco tips recommended for flame gouging are Style 183, which is a bent tip, and Style 185 straight tip.

For complete information on Airco flame gouging call or write to your nearest Air Reduction office.

★ BUY UNITED STATES WAR BONDS ★

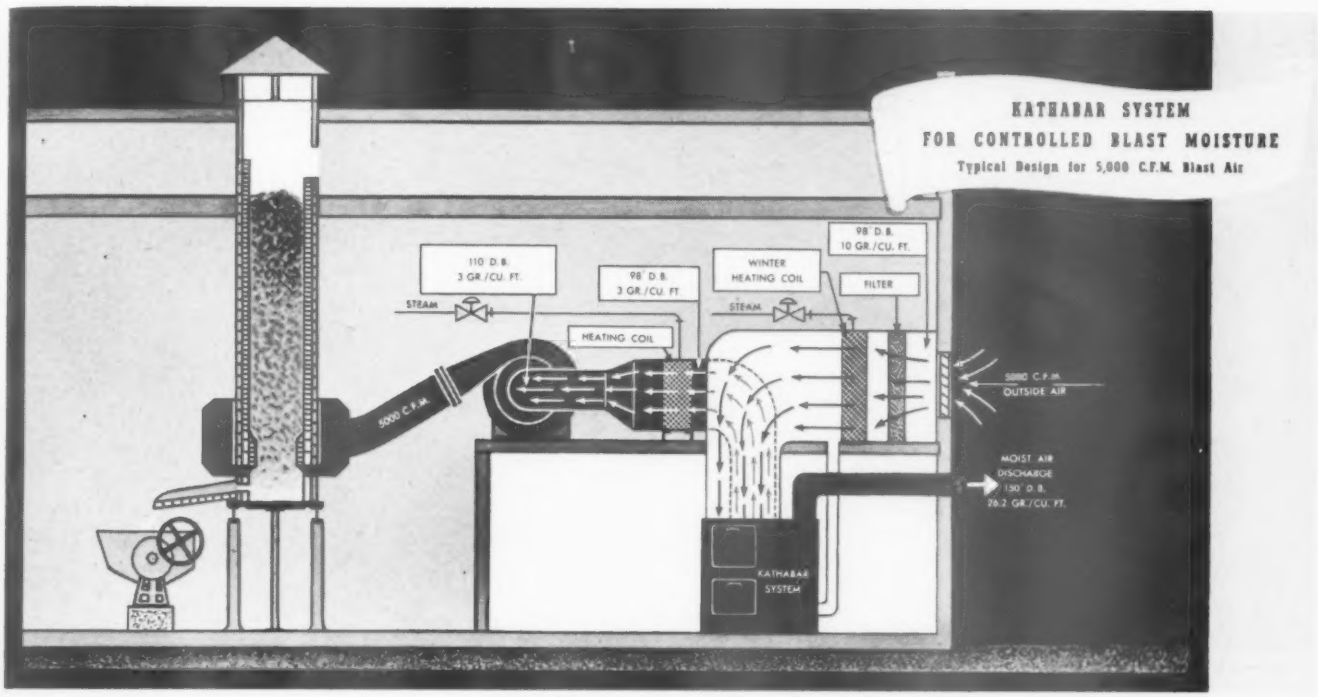
AIRCO WILSON

AIR REDUCTION

General Offices: 60 EAST 42nd STREET, NEW YORK 17, N. Y.

In Texas: MAGNOLIA AIRCO GAS PRODUCTS CO. • General Offices: HOUSTON 1, TEXAS

Offices in all Principal Cities



UNIFORM, HOT METAL

★ As every foundryman knows, it is much easier to run a cupola in winter than in summer. The moisture content of the air may vary from as low as 3 lbs. of water per ton of air on a relatively dry day, to 40 lbs. of water per ton of air on a very humid day. And it takes about one ton of air to melt a ton of iron. Excess moisture in the blast means greater coke consumption and lower pouring temperature, also greater losses of silicon and manganese.

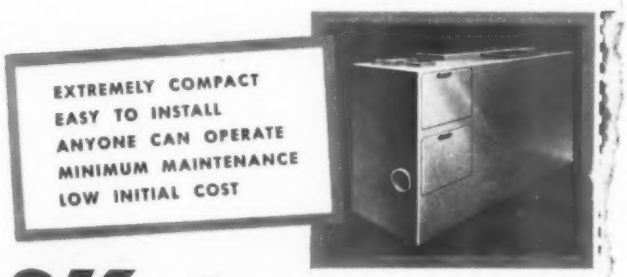
Moisture Content Can Be Controlled

Today, with a Kathabar System, it is possible to control the moisture in the air delivered to the cupola within very close limits, reproducing from day to day conditions most suitable for the type of work being handled.

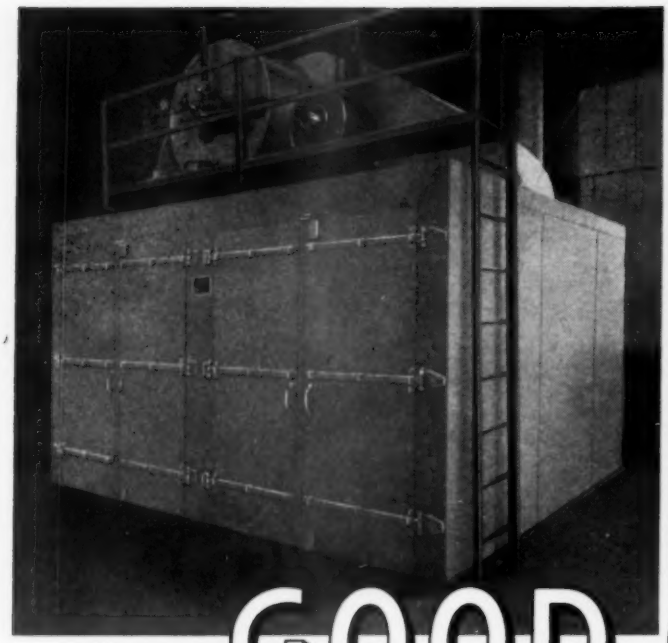
The results from fourteen different installations of Kathabar units prove the effectiveness of this method. Not only is the temperature of the metal increased (50° to 80°) but the resultant castings are more easily machined, casting losses are reduced and there is a saving in coke (sometimes up to 25%).

Users of Kathabar moisture control systems are aiding the War effort thru producing better castings now (one user is the main supplier of piston rings for aviation motors) and will be better able to meet the needs of Post-War America.

Why not investigate the advantages of moisture control now? Send for further details.



SC Kathabar System of
MOISTURE CONTROL
FOR CUPOLA DRY BLAST



GOOD OVENS

REDUCE Foundry Costs

There is not much doubt that postwar competition in the heavy goods industries will be keen, not only between individual businesses but between materials and processes as well. It will be imperative for the foundry to produce good castings at lower costs than ever before.

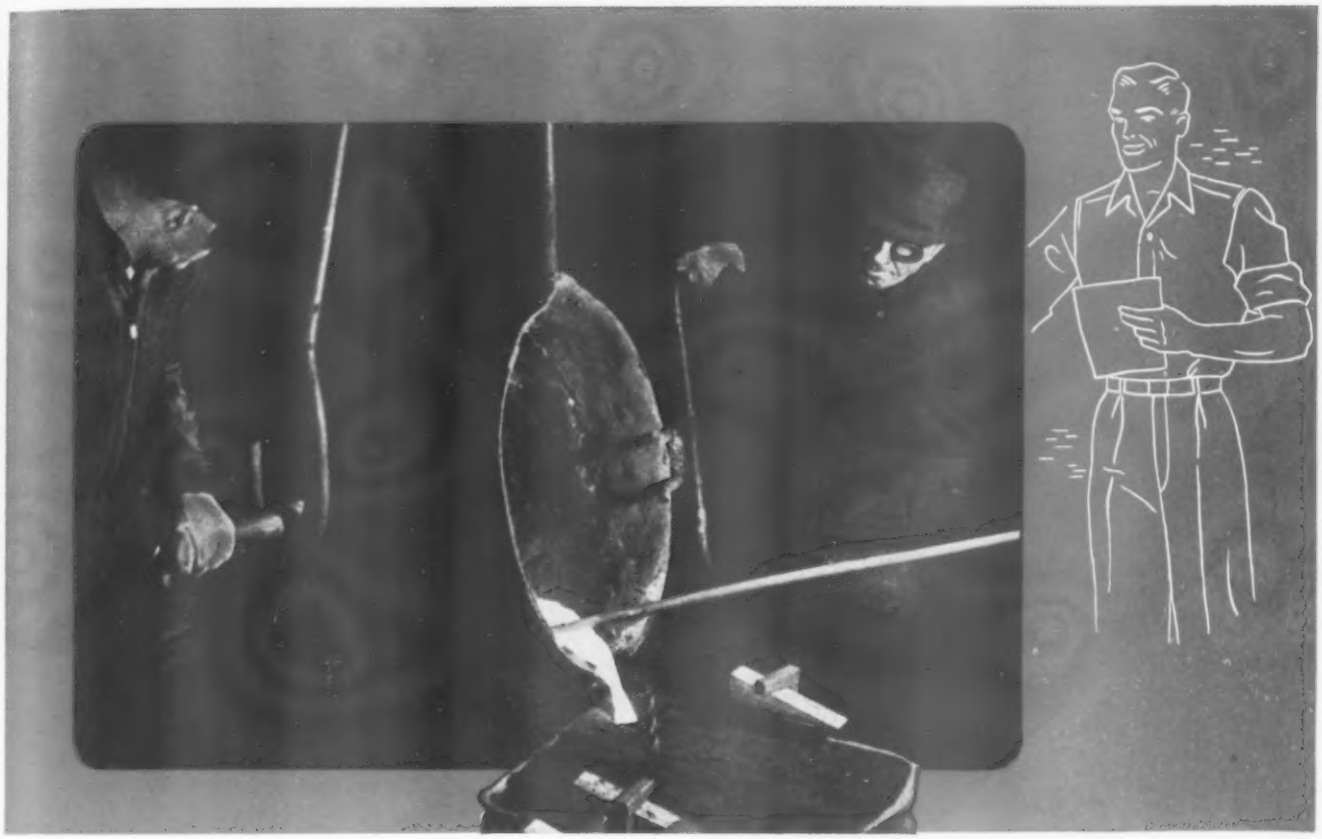
Good ovens assure good core and mold baking at maximum production rates and at minimum baking costs, NOW as well as during the postwar period.

One Young Brothers' customer says, "Your ovens are doing a much better job than those immediately along side of them." Another says, "The pull drawer oven is working splendidly at 550° F." Still another says, "Your oven is doing a swell job. We are fully satisfied."

NOW IS THE TIME to prepare for Postwar Competition and Oven Equipment is an Important Thing to *Check*

YOUNG
BROTHERS COMPANY
6508 MACK AVENUE
DETROIT, MICHIGAN

YB Co



He's Always at Your Elbow

TO HELP BOOST PRODUCTION

Would you like to step up your output of finished castings? It may be possible with your present equipment—or it may not. A Republic Pig Iron Metallurgist can tell you.

This man is more than a metallurgist. True, he knows the technical side of irons and what they should do or not do under various conditions. But more than that, he's an experienced foundryman, who knows foundry practice from actually working in foundries.

He is ready to make a survey of your equipment and methods. Then he can tell you if you are realizing the full potential of your foundry — and if not, how to do it. Sometimes a slight change works wonders.

Write, wire or phone us. If a metallurgist happens to be in your territory, he will call on you promptly.

REPUBLIC STEEL CORPORATION
General Offices: Cleveland 1, Ohio
Berger Manufacturing Division • Culvert Division
Niles Steel Products Division • Steel and Tubes Division
Union Drawn Steel Division • Truscon Steel Company
Export Department: Chrysler Bldg., New York 17, N. Y.

Republic PIG IRON

"CHATEAUGAY" Low-Phosphorus, Copper-Free

"REPUBLIC" (Northern) Foundry, Basic and Malleable

"PIONEER" (Southern) Foundry and Basic

ALSO TRUSCON FOUNDRY FLASKS • REPUBLIC CORE WIRE • FOUNDRY NAILS

Adams Cherry Slip Flasks

—for dependable, low-cost production

Adams Cherry Slip Flasks are custom-built to your specifications, with any desired length, width or depth. Material is close-grained cherry lumber, with machined malleable trimmings.

The sand-strip mechanism is quick-acting and convenient and it will stand up under the jolting and squeezing of power machines.

Pins to suit your preference—wide-V, double-V, round, double round or special types, accurately machined on bearing surfaces.

Adams Cherry Snap Flask

THE ADAMS COMPANY

MOLDING MACHINES · FLASK E

Adams Cast Iron Jackets

—assure perfect mold protection

The unique patented construction of the Adams Cast Iron Jacket, combining horizontal and vertical corrugations, provides great strength and rigidity with minimum weight.

Inner surfaces are accurately surface ground, and assembly is made on a fixture to exact size and to assure correct taper in the case of tapered jackets.

Specify Adams Jackets for proper mold protection. For best results, use them in combination with Adams Cherry Slip Flasks or Adams Cherry Snap Flasks.

Adams Steel Jacket

NY · DUBUQUE, IOWA · U.S.A.

EQUIPMENT Established 1883

CLEAN CASTINGS
INCREASE PRODUCTION

TAM FOUNDRY ZIRCONITE SAND YIELDS SMOOTH CASTINGS AND REDUCES CLEANING TIME

TAM Foundry Zirconite Sand used for the entire mold or as a facing sand resists the burning in of the metal and makes possible the production of clean castings and the expansion of output by reducing time in the cleaning department.

TAM Foundry Zirconite Sand does not warp, requires minimum venting and the faster chilling permits better metal distribution into heavy sections and reduces "hot tears"! Four important factors.

TAM Foundry Zirconite Sand is available in three grades, Zirconite Sand A has an approximate melting point of 3812° F. Zirconite Sands B and C 3650° F.

Full particulars on the proper applications of Foundry Zirconite Sands will be sent immediately upon request. Write:

TITANIUM
ALLOY MANUFACTURING COMPANY

TAM Foundry Zirconite Sand "A" was used in the core for the chrome steel impeller wheel illustrated. Note the clean, smooth surfaces.

TAM
ZIRCONIUM AND TITANIUM PRODUCTS
Registered U. S. Pat. Off.

GENERAL OFFICES AND WORKS: NIAGARA FALLS, N. Y., U. S. A.
EXECUTIVE OFFICES: 111 BROADWAY, NEW YORK CITY

Representatives for the Pacific Coast . . . BALFOUR, GUTHRIE & CO., San Francisco, Los Angeles, Portland, Seattle, Tacoma
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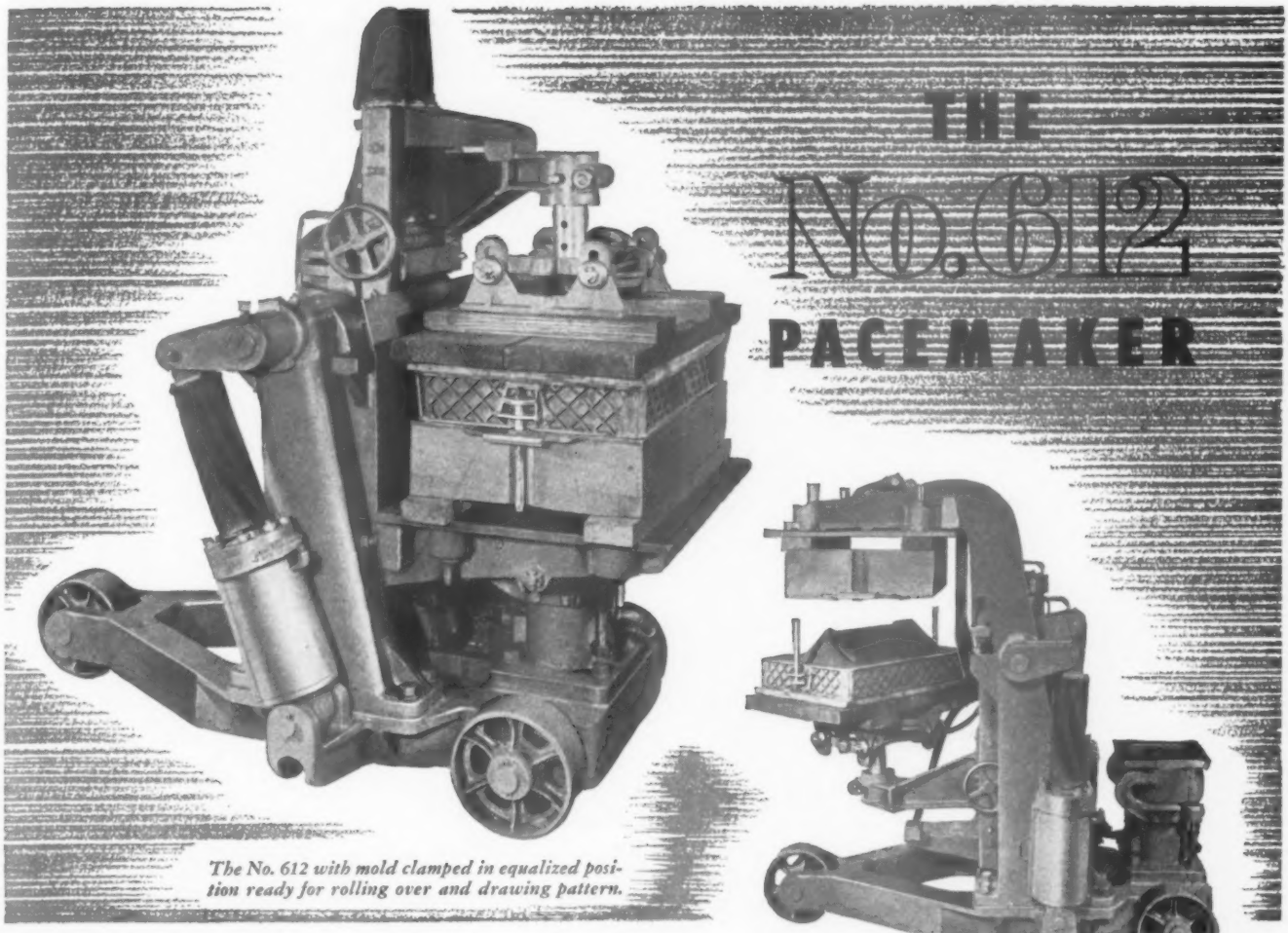
Representatives for Europe . . . . . T. ROWLANDS & CO., Ltd., 23-27 Broomhall St., Sheffield, England



The No. 612 with mold clamped in equalized position ready for rolling over and drawing pattern.

The No. 612 machine, rolled-over, showing the flask drawn from the pattern.

...For Work Requiring Absolute Accuracy in Ramming and Drawing

★ Newly introduced, this No. 612 portable, jolt, roll-over pattern draw machine is specially designed to meet present day foundry specifications . . . is ideally used in making the intricate cores and molds required in the aircraft and other precision industries.

This machine features an automatic air-operated clamp and equalizer. It is of open-end construction and is easily adjustable for flasks and core boxes of various sizes and heights. The No. 612 has a positive valve-less jolt, free from vibration and rebound, and two roll-over cylinders with oil dash pot control that assures smooth uniform operation.

Our fully descriptive catalog giving complete details of this and other Johnston & Jennings Molding Machines furnished gladly. Send for a copy today.

THE JOHNSTON AND JENNINGS CO.
667 ADDISON ROAD • CLEVELAND 14, OHIO

A COMPLETE LINE PROVEN IN SERVICE INCLUDING—

PLAIN AIR JOLTS
in 12 different sizes

JOLT SQUEEZERS
fast sturdy machines—3 sizes

JOLT STRIPPING PLATES
4 sizes ranging up to 16″ draw

JOLT, SQUEEZE, STRIPPING PLATE AND PATTERN DRAWS
Popular for medium service —2 sizes

PORTABLE JOLT ROLL-OVER AND PATTERN DRAW
A heavy duty thoroughly dependable machine—portable

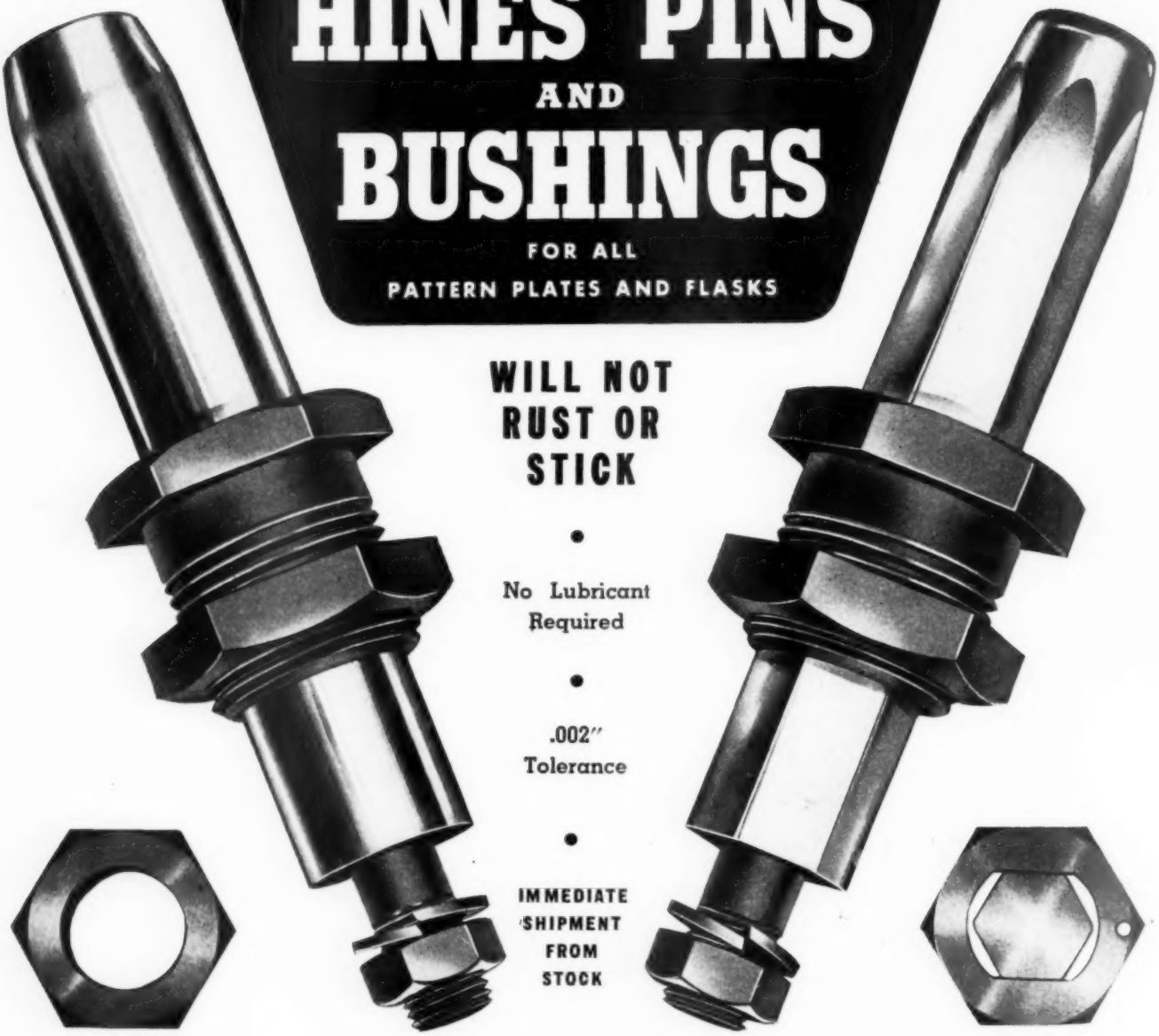
JOLT ROLL-OVER AND PATTERN DRAWS
Fast large capacity machines with roll-out conveyors — 4 sizes

Write for fully descriptive catalog giving complete specifications.

HARDENED....GROUND....CHROME PLATED

HINES PINS AND BUSHINGS

FOR ALL PATTERN PLATES AND FLASKS



WILL NOT RUST OR STICK

•

No Lubricant Required

•

.002" Tolerance

•

IMMEDIATE SHIPMENT FROM STOCK

THE BUSHINGS—Round or oblong, held in place by simple lock washer and jam nut. Accurate and hardened. Made in two lengths for thick or thin plates. Easy to install. Sets of tools consisting of two wrenches and one counterboring tool take care of all installations.

THE PINS—Round or Hexagon, hardened, ground and chrome plated. Extremely accurate, will not stick or rust. Made in various sizes with long or short shanks. Thousands of Hines Pins and Bushings are already in use, eliminating a great source of trouble for the pattern shops. Write for complete details.

THE HINES FLASK CO.

1324 HIRD AVENUE — CLEVELAND 7, OHIO

Ransohoff

Automatic Star-Return WET CLEANING MILLS

BIG SAVINGS PER JOB BOOST PROFITS FOR THE JOB SHOP

EVERY job, large or small, must pay its own way . . . and leave a good margin for profit . . . in the job shop. There's no way to spread out costs . . . no chance to "average up." That's why you should use the right equipment.

10 MINUTES FROM START TO FINISH

to load, clean and unload a 3,000 lb. batch

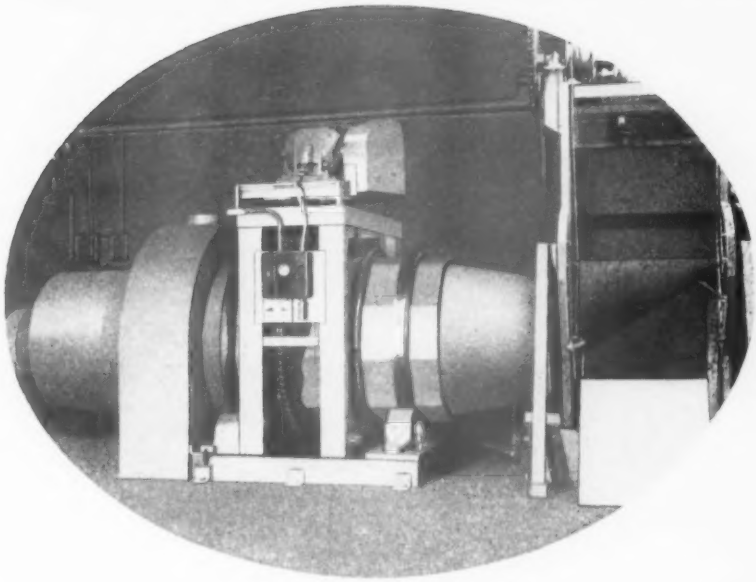
• • •

Speedy . . . gentle . . . economical cleaning

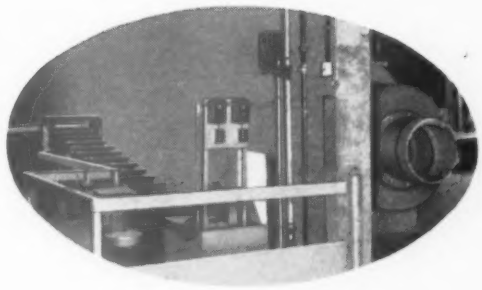
• • •

THE RANSOHOFF WET METHOD SAVES 30% TO 70% ON YOUR CLEANING COSTS

Castings cascade in a mass in which stars are intermingled thoroughly. All voids are filled completely with various sized and shaped stars which enter and return automatically. Very rapid cleaning results without nicking, breaking or excessive wear on mill lining. No need of dust collectors. Health hazards are reduced.



60" x 72" End-Loading, End-Unloading Automatic Star Return Wet Cleaning Mill installed in a malleable job shop in Michigan. The power loader sets in a pit below floor level for greater ease in loading. Mill is cleaning hard iron malleable castings.



The sand conveyor is placed on the other side of the wall from the cleaning mill for continuously removing the sand as it is flushed from the mill.

RANSOHOFF ENGINEERS will be glad to clean a sample batch and show you how to save costs.

N. RANSOHOFF, Inc.

Township Ave. and Big 4 R. R.
CINCINNATI, OHIO

MEMO

TO AMERICAN FOUNDRY MEN!

WE PROUDLY ANNOUNCE..

Bon

A CORE AND FACING BINDER

to increase the flow of production so greatly needed now

BONDITE is a superior dry type foundry core and facing binder of hydrocarbon base, the proper use of which will save binder and new sand expense, and will produce cleaner castings, and increase production in steel, iron and brass.

BONDITE, unlike some of the heavier binders, weighs only 4 lbs. per gallon. Used in conjunction with Bentonite . . . . . BONDITE makes a very inexpensive mix.

BONDITE, unlike oil and other binders, works successfully in

old sand. This is attributed to the fact that there is less deterioration due to fusion and breakdown.

BONDITE on ignition produces a carbon type gas that covers surface grains, giving them a protective coating against metal action, thereby prolonging the life of any type of silica sand. Binders generally used, particularly on manganese, permit sand to fuse.

BONDITE burns out almost completely with little or no residue for it is approximately 98% volatile. Gases produced have no detrimental action on metal. Cores and facing sand made with BONDITE show more permeability, consequently finer grained sand can be used, thereby producing smoother castings.

BONDITE skin dries very easily and fast, increasing production by eliminating oven drying.

BONDITE proportions should be increased on heavier sections. However, the following mix is recommended for use on medium size castings.

BONDITE, by weight—use 1¼% to 1½%. Add Bentonite as necessary to obtain desired green and hot strength. Drying time can be cut at least 25% over oils. The above mix will work both in dry sand or skin drying. This will produce very smooth castings.

BAKE BONDITE CORES AT 450 TO 500° F.

Bondite Corporation

1325 EAST 38TH STREET, LOS ANGELES 11, CALIFORNIA • JEFFERSON 3178 ■ 844 150TH STREET, HAMMOND, INDIANA

there's NO ARGUMENT about it

Some foundrymen, who have not put it to a thorough consistent test, may question the effectiveness of iron flux—but the users of Famous CORNELL Cupola Flux endorse it with vigor and enthusiasm.

There is really *not the slightest valid argument* against its use but all the evidence one may desire as to its merit.

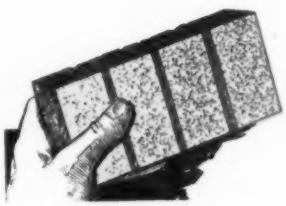
Everyone knows that there are slag and impurities in the "melt"—that their removal improves the strength, machinability and general quality of the castings.

This salutary action is readily apparent following the consistent use of Famous CORNELL Cupola Flux—in a more active slag hole—and all the valuable results that inevitably follow this purging.

There will never be a better time than NOW for non-users to begin using Famous CORNELL Cupola Flux for foundries will soon begin swinging back to domestic production when highest quality will be necessary for successful competition.

Write TODAY for literature and let us get you started properly in the use of this product whose effectiveness has been demonstrated in steadily increasing sales over a period of 25 years.

FAMOUS CORNELL FLUXES



There are CORNELL FLUXES for purging iron, brass and aluminum.

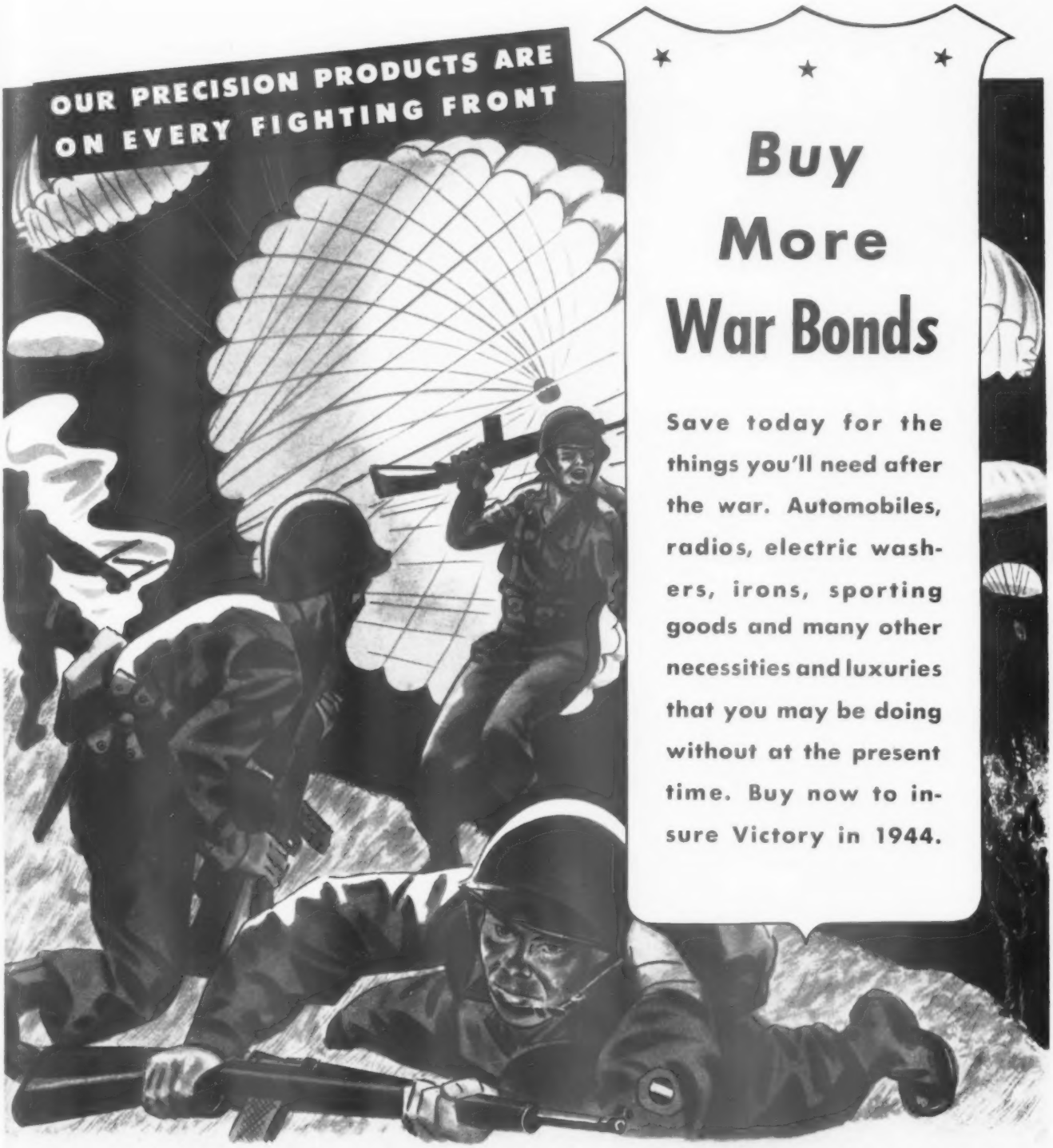
Most popular is the Famous CORNELL Cupola Flux in the resultful, economical, convenient brick form pictured above.

The CLEVELAND FLUX *Co.*

Manufacturers of Iron, Brass and Aluminum Flux Since 1918

1026-36 Main Ave., N. W.

CLEVELAND, OHIO



Buy More War Bonds

Save today for the things you'll need after the war. Automobiles, radios, electric washers, irons, sporting goods and many other necessities and luxuries that you may be doing without at the present time. Buy now to insure Victory in 1944.

WOOD AND METAL PATTERNS • KELLER AND DUPLICATOR WORK • MACHINE WORK • MALLORY METALS • BERYLLIUM COPPER • MONEL METAL • EVERDUR CASTINGS

COPPER CASTINGS OF HIGHEST ELECTRICAL CONDUCTIVITY

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BRASS, BRONZE AND ALUMINUM CASTINGS

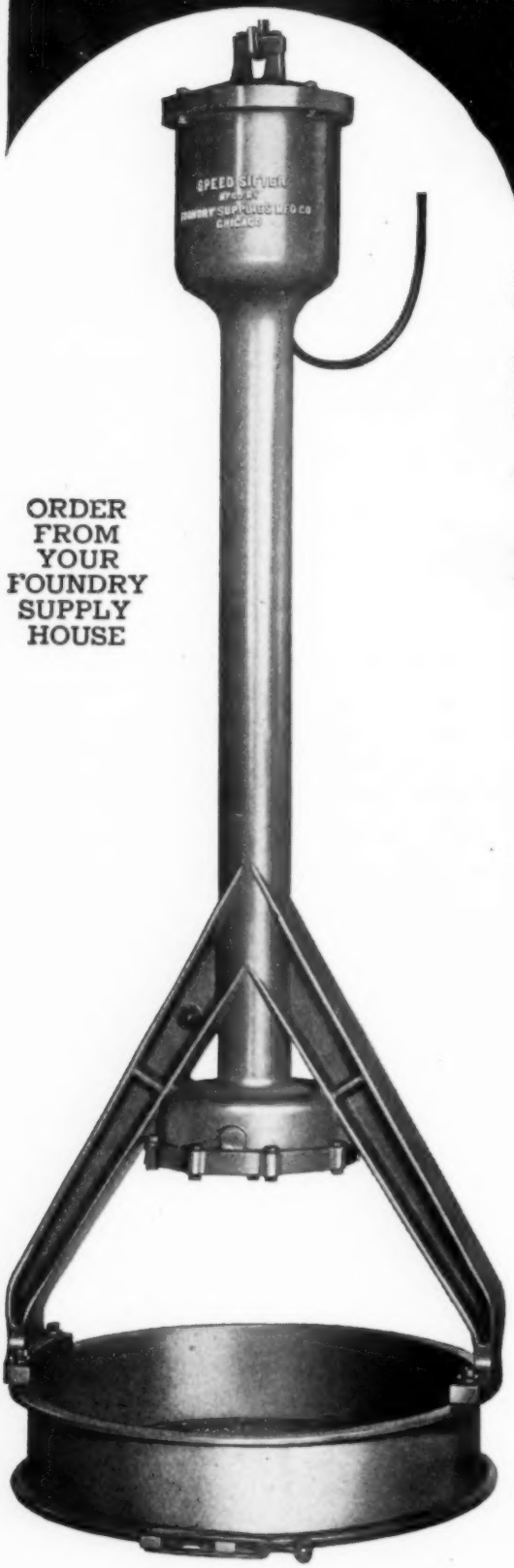
CITY PATTERN

FOUNDRY AND MACHINE CO.

1165 HARPER AVE. at RIVARD ST., DETROIT 11, MICH.

Increase Production with
ROTOPLANE Speed Sifters

"Hard-to-Please" Foundries Standardize on Rotoplane!



ORDER FROM YOUR FOUNDRY SUPPLY HOUSE

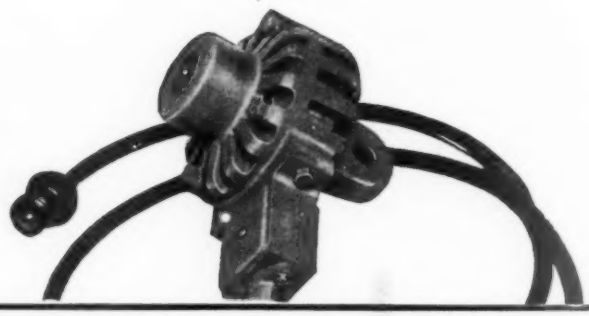
Try ROTOPLANE in your plant. You, too, will find it increases production, does *all* your sifting more quickly and economically. One size and type for all sifting jobs.

ROTOPLANE is built for long, dependable service. Strong, one-piece frame gives remarkably effective vibration. Smooth, free, rotary action. All mechanism completely enclosed and dustproof. Weight approx. 90 lbs., 62 in. high overall.

Steel-mounted sieves instantly interchangeable. No jagged screen edges, no storage problem. 20 in. diameter clear sifting area.

TEN DAYS FREE TRIAL.

$175.00 f.o.b. Chicago—complete with cable, safety ground wire, one sieve (2-4 mesh). Standard ½ h.p. motor, 115-230 volts 60 cycle single phase.
Prices with other motors quoted on request.



ELECTRIC VIBRATORS

True-to-pattern castings make satisfied customers . . . more repeat business. Increase your production and castings quality with RED Electric Vibrators. Sturdy, dustproof, lowest operating cost (electricity does not freeze). Unequaled for consistent year-'round results in foundries all over the world.

(All Prices f.o.b. Chicago)

No. 1—Light match plate work $10.00	No. 5—Heavy match plate, tub, bench $17.00
No. 2—Medium match plate 13.00	No. 9—Machine and heavier 24.00

FOUNDRY SUPPLIES MANUFACTURING CO.

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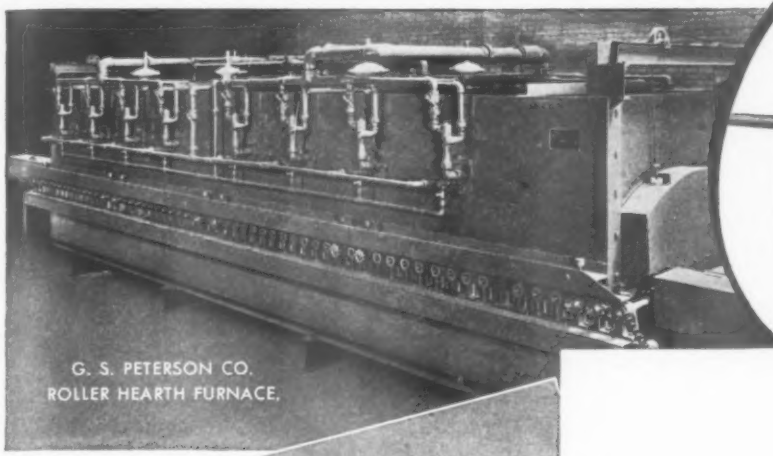
CABLE ADDRESS: "ROTOPLANE CHICAGO"

Save fuel... end worries

with a NORTH AMERICAN COMBUSTION SYSTEM



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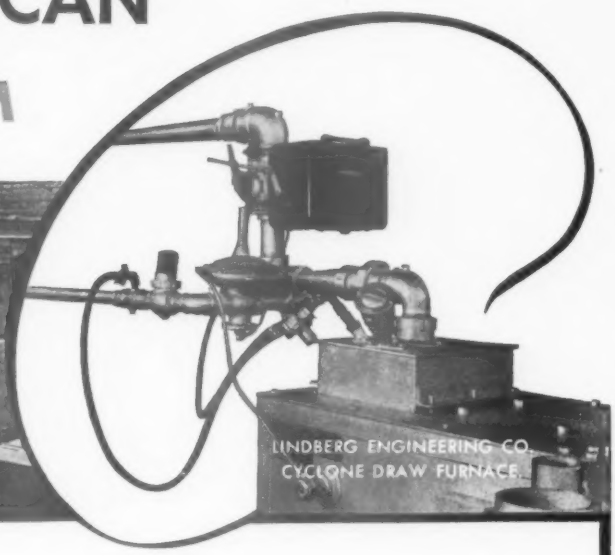
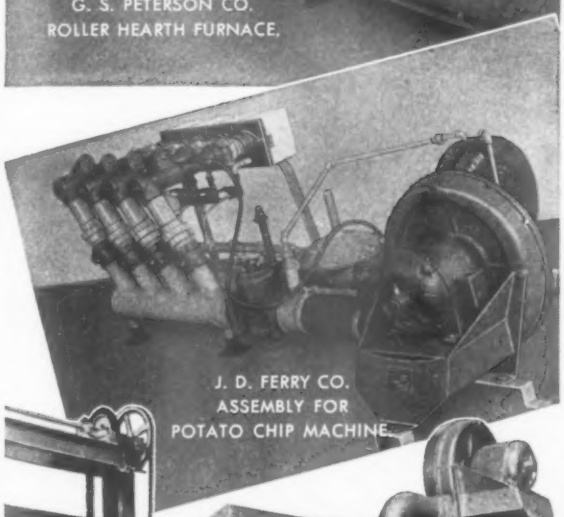
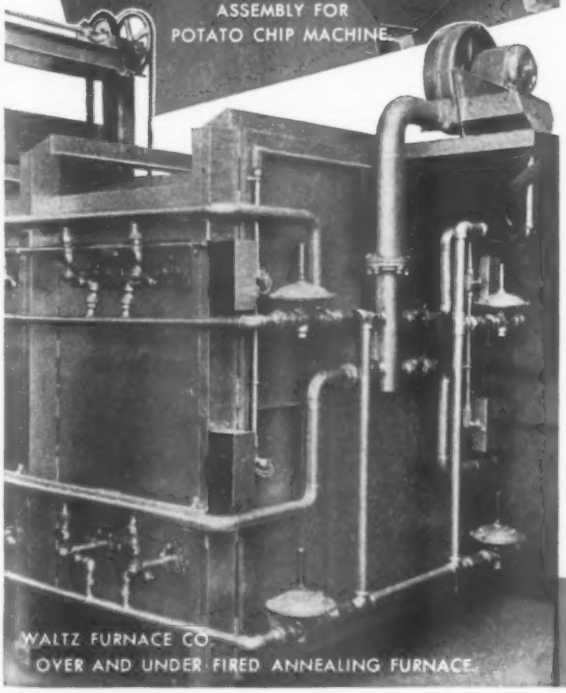
ROLLER HEARTH FURNACE.



LINDBERG ENGINEERING CO.
CYCLONE DRAW FURNACE.



J. D. FERRY CO.
ASSEMBLY FOR
POTATO CHIP MACHINE.



WALTZ FURNACE CO.
OVER AND UNDER FIRED ANNEALING FURNACE.

Let us take the responsibility for the entire combustion system on your furnaces.

A NORTH AMERICAN factory-trained engineer is ready to help you select a complete combustion system consisting of the Turbo Blower, Proportioning Devices, Regulators, Control and Safety Valves, Pilots and Burners. But his job will not end there. Whether the fuel is gas, oil, or both, he will specify the correct pipe sizes needed to join these parts into an integrated combustion system which will operate at top efficiency and economy.

Specify NORTH AMERICAN today—all the way!

"NORTH AMERICAN for COMBUSTION"

THE NORTH AMERICAN MANUFACTURING COMPANY

MANUFACTURERS OF INDUSTRIAL FUEL BURNING EQUIPMENT FOR GAS OR OIL

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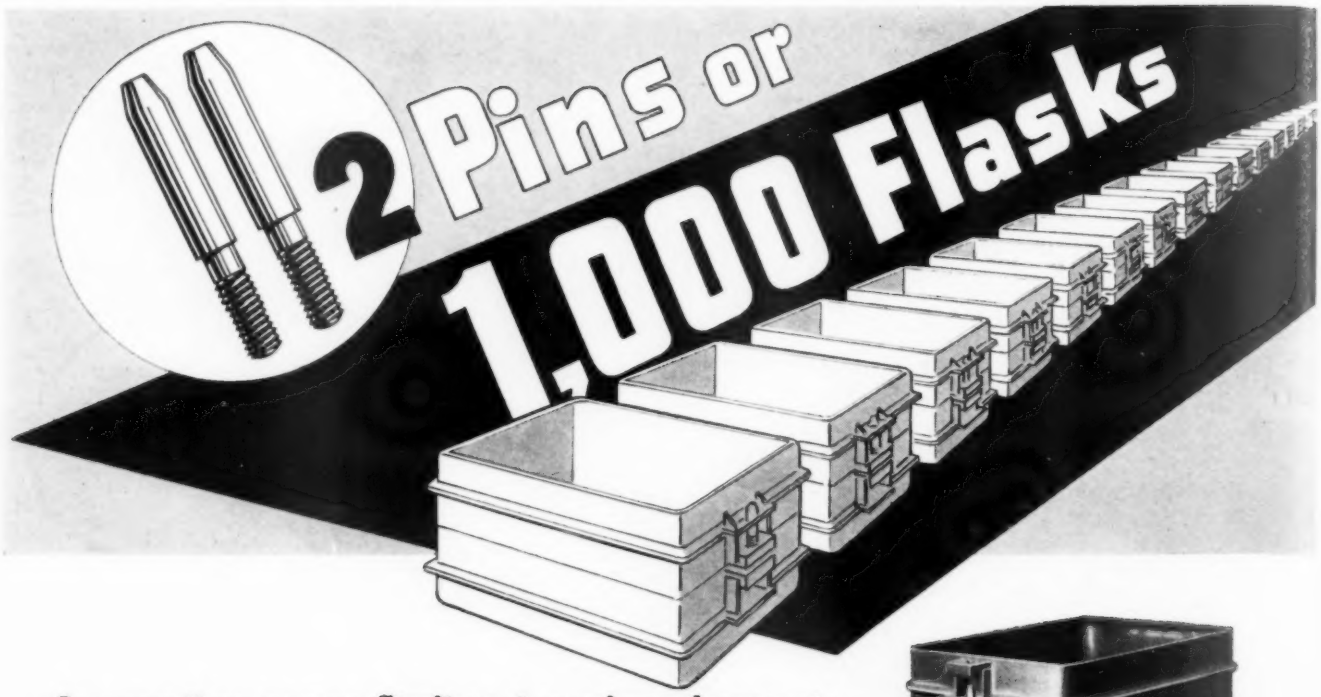
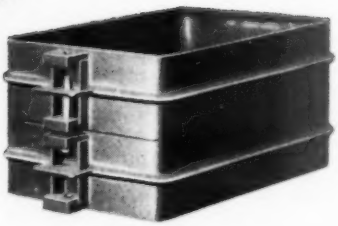
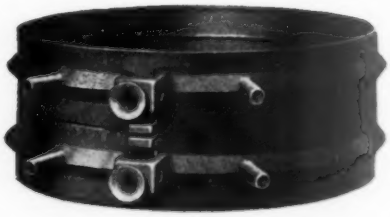
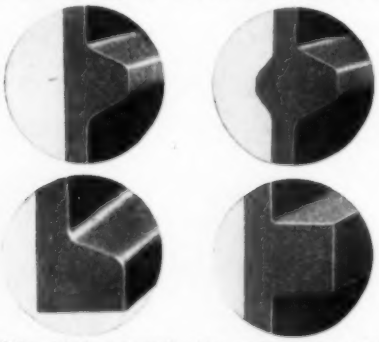


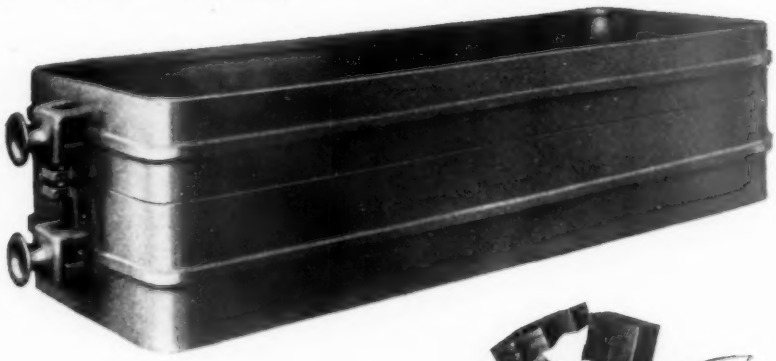
In peacetime or war, Sterling sincerely endeavors to take care of ALL customer friends, regardless of the size of order. Your current requirements may call for as many as 1,000 flasks . . . or only 2 pins . . . in either case, the order will have our careful attention and will be shipped as rapidly as conditions permit. Remember, Sterling is backed by 34 years of specialized experience and has the facilities to turn out practically any type and size of flask or pin...and in any quantity. For complete foundry flask service — consult Sterling.







All-welded, integral ribs and flanges; solid center reinforcing rib; square flanges; full width bearing, aids speed and accuracy . . . simplifies ramming and shaking out. (Pat. 1974292)



Sterling FOUNDRY FLASKS

STERLING WHEELBARROW COMPANY • MILWAUKEE, WIS., U. S. A.

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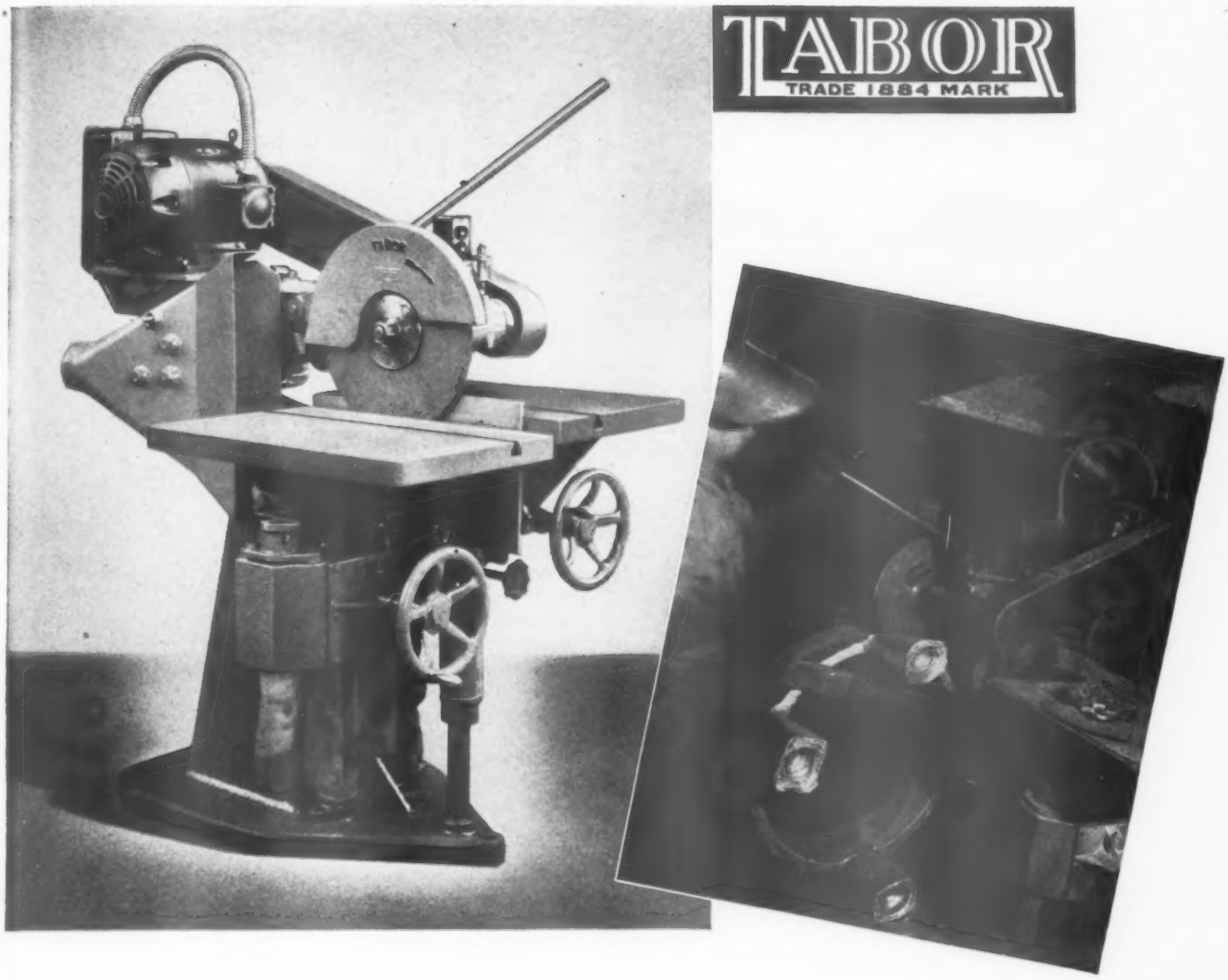

TABOR
TRADE 1884 MARK

TABOR-BRASIVE CUT-OFF MACHINES

Users say . . .

". . . We highly recommend the Cut-Off Machine which we purchased from you a few months ago. It is a real saving in time, money and labor. Before we purchased this machine, we used saws and this process was long. The machine saves us both time and labor as it cuts the castings much quicker and better. We have also eliminated the heavy expense of the band saws and we find that the expense connected with the machine is far less than the amount of the saws used . . ."

And

". . . advising you again how pleased we are with the machine. It has been running steadily since we received it in June (two months) without a single break-down of any sort, and it has made hundreds of cuts during this time.

. . . Assuring you that at any future time we may be in need of machines of this nature, we will certainly contact you first, we are, etc."

Tabor-Brasive Cut-Off Machines save time, money and labor in cutting gates and risers from castings of manganese bronze, nickel, Monel and other non-ferrous alloys, as well as alloy steel. Built in a complete line of sizes and types to meet any cutting need.

THE TABOR MANUFACTURING COMPANY
6225 Tacony Street • Philadelphia • Pennsylvania

Representatives: Snyder Foundry Supply Co., *Los Angeles, Calif.;* Pacific Graphite Works, *Oakland, Calif.;* Carl F. Miller & Co., *Seattle, Wash.*

Fast Cutting NORTON RESINOID DISCS

. . . Can Speed Cleaning Room Production

IF YOU are using disc grinders for finishing castings you'll want to take advantage of the fast cutting action of Norton Resinoid Discs.

Countless resinoid bond formulae were studied by the Norton research laboratories to develop one with just the right strength for foundry service—a bond that would hold each grain firmly until its job was done, then release it to bring fresh, sharp grains into action.

Norton Resinoid Discs are available in Alundum abrasive for steel castings and in Crystolon abrasive for gray iron castings. They are made in sizes and mountings for all types of disc grinders—vertical or horizontal spindle. Norton abrasive engineers are ready to study your disc grinding jobs and specify the correct Norton Disc for each.

And there's a special Norton booklet on discs. Just write for Form 1141-F.

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NORTON ABRASIVES

LIGNOLITE

NON CRITICAL

PATTERN PLATES

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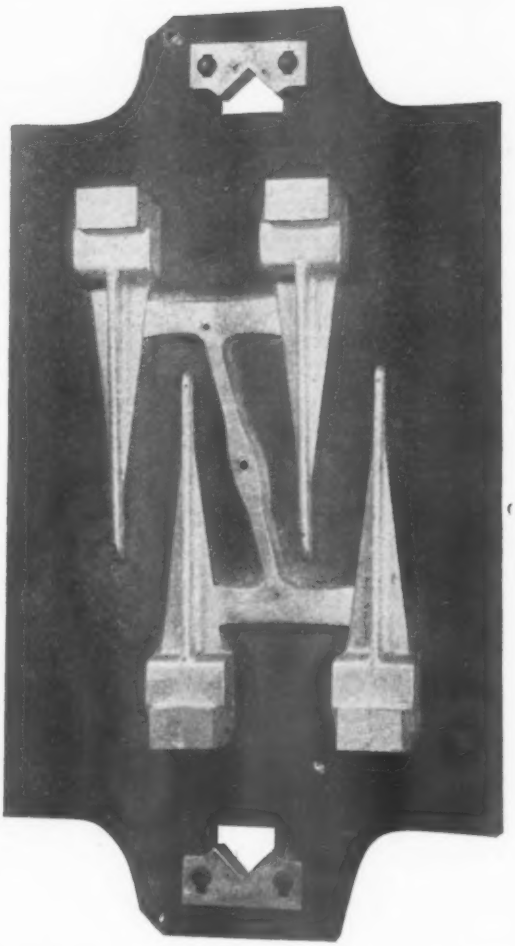

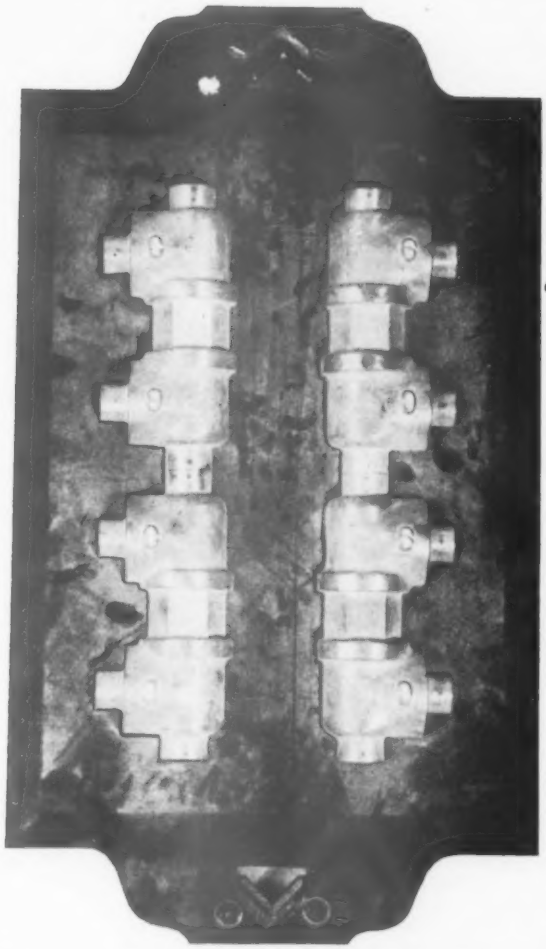

- FLAT
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- HIGH STRENGTH
- EASILY MACHINED
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STANDARD SIZES—HOW TO ORDER

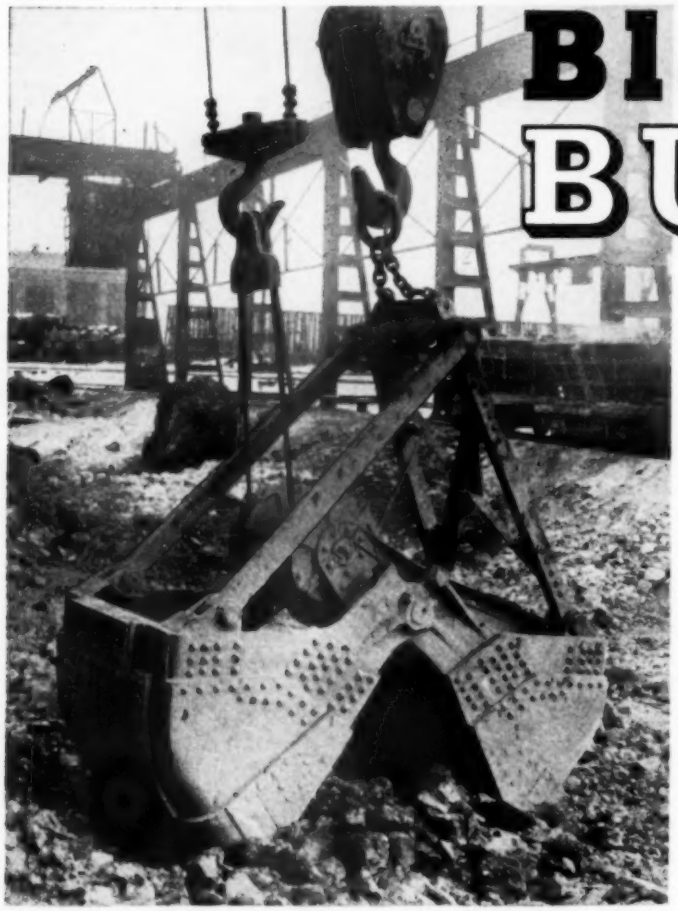
Available in all flask sizes, 3/8" to 2" thick. Standard plates are octagonal in shape with 1" allowance for flask and 2½" allowance for ears. Sheets are also available for own cutting. Sizes are 46" x 46" for thicknesses from 3/8" to 1½" inclusive; 40" x 40" for thicknesses over 1½". Please write for sample and complete information.

MARATHON CHEMICAL COMPANY

DIVISION OF MARATHON PAPER MILLS COMPANY

ROTHSCHILD WISCONSIN

Cranemen prefer the easy control and massive build of



Blaw-Knox BUCKETS

Designed for the craneman's convenience, this controllable two line "hook-on" bucket has the massive build and easy operating features needed for digging open hearth slag and handling stock house materials.

This is one of a variety of designs developed for the steel plant operator who demands buckets to do the job and stand the gaff.

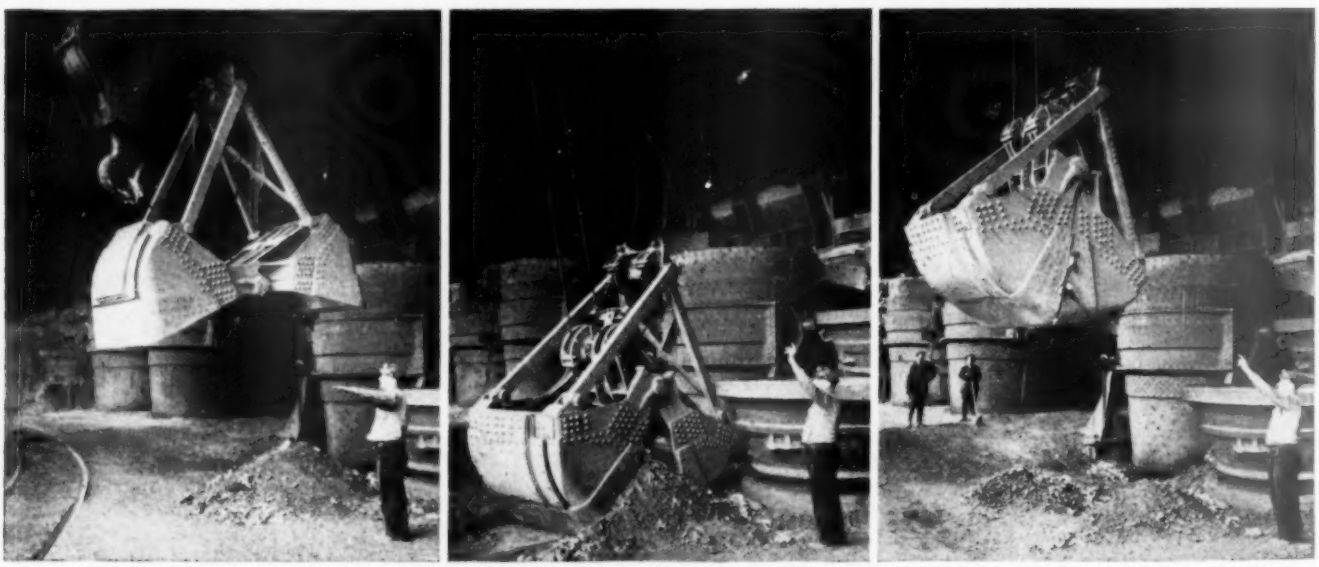
An interesting study of Blaw-Knox Buckets for steel plant service is presented in two catalogs which you should have. Ask Blaw-Knox to send you

Catalog No 1696—Blaw-Knox Single Line and "Hook-on" Buckets

Catalog No 1865—Blaw-Knox Four Rope Buckets for Coal, Ore, etc.

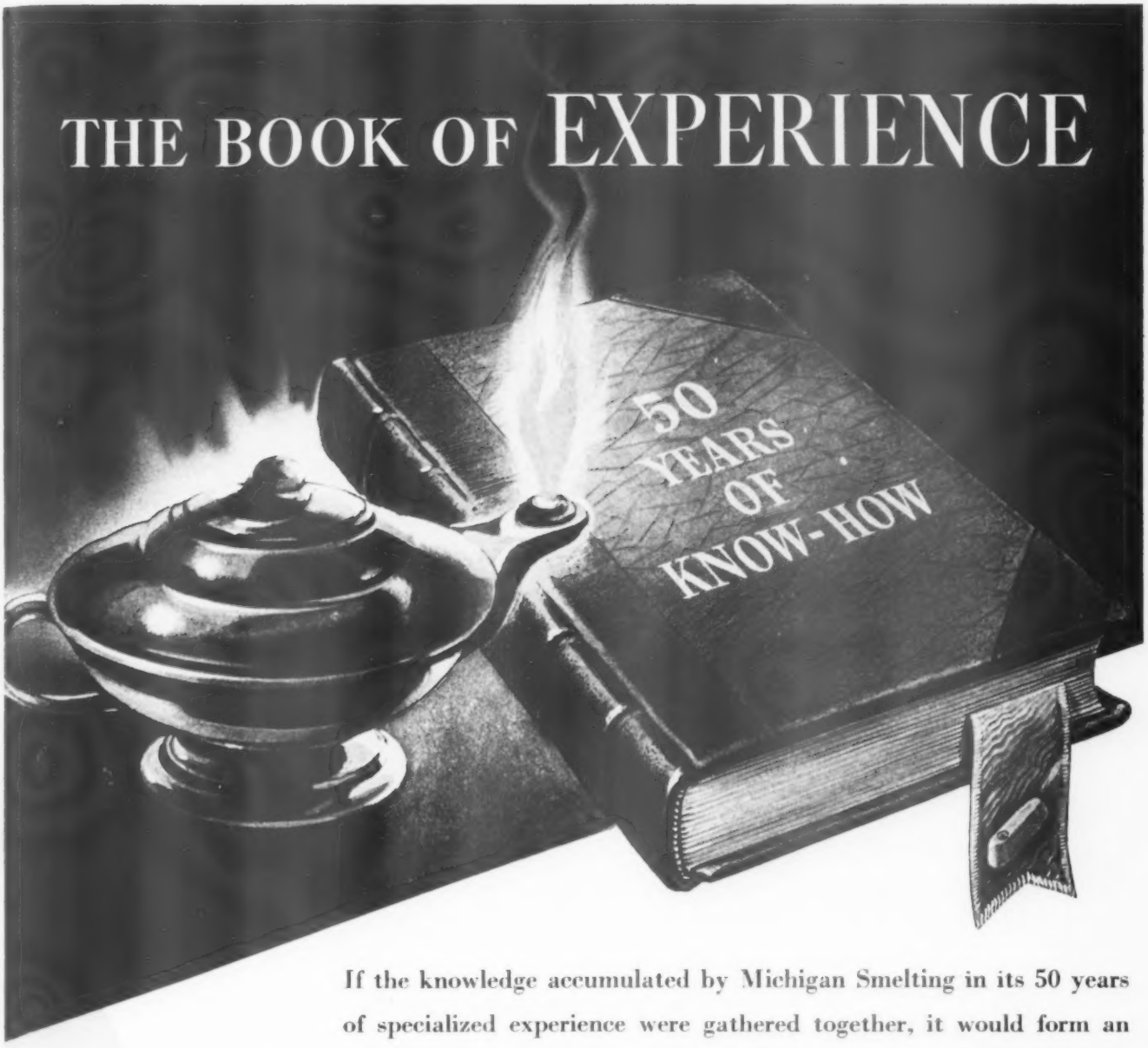
Blaw-Knox Two Line "Hook-on" Bucket, for two hook block operation. This is a heavy duty type for operating in the slag drop. This particular bucket is rated 3 cu. yd. capacity, weighs 19,300 lbs. The operating clearance, reeved two parts, is 16 ft. 3 in.

BLAW-KNOX DIVISION
OF BLAW-KNOX CO.
2097 FARMERS BANK BLDG. PITTSBURGH, PA.
NEW YORK CHICAGO PHILADELPHIA
BIRMINGHAM WASHINGTON



These illustrations show the operating phases of a heavy duty Blaw-Knox two line "hook-on" bucket, handling open hearth slag from the pits. The bucket is rated 3 cu. yd. capacity and weighs 19,400 lbs. The operating head room reeved two parts is 16 ft. 7 in. — reeved three parts, 23 ft. 5 in.

THE BOOK OF EXPERIENCE



If the knowledge accumulated by Michigan Smelting in its 50 years of specialized experience were gathered together, it would form an authoritative and basic reference book covering this entire industry. Non-ferrous scrap metal refining has been our business for half a century. The sound technical knowledge and wide practical experience possessed by our executive staff is at your disposal. When you are in the market for non-ferrous alloys, consult us for your requirements, no matter how rigid, exacting or unusual.

BUY
WAR
BONDS

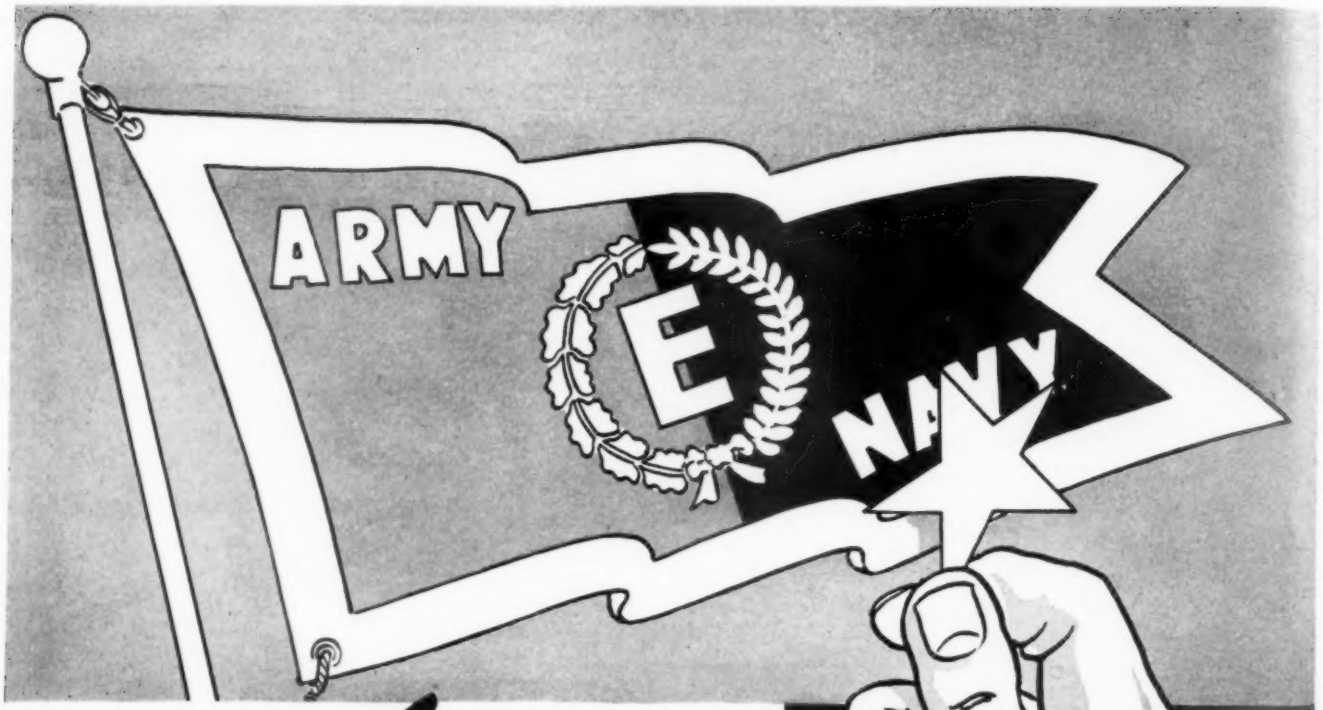
NON-FERROUS SCRAP METAL REFINERS FOR 50 YEARS

MICHIGAN SMELTING and Refining

Division of

BOHN ALUMINUM & BRASS CORPORATION · Detroit, Michigan

General Offices: Lafayette Building



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MANUFACTURERS OF

DELTA FOUNDRY PRODUCTS

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ARMY SPECIFICATION OILS AND SPECIAL LUBRICANTS

HAVE BEEN HONORED

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A STAR HAS BEEN ADDED TO THEIR ARMY-NAVY "E" FOR CONTINUED EXCELLENT PRODUCTION OF WAR MATERIALS

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DELTA CORE & MOLD WASHES

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Delta Steelkoat

Delta Special Core & Mold Wash

For GREY IRON & MALLEABLE

Delta Grakoat

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For NON-FERROUS METALS

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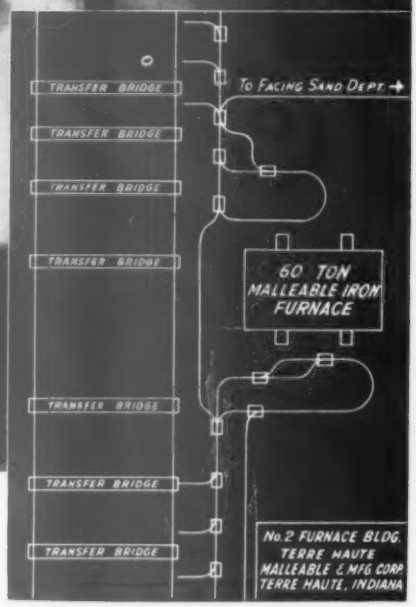
ENGINEERING SERVICE PROVES PROFITABLE TO MALLEABLE FOUNDRY



DETAILS OF TRAMRAIL SYSTEM

The metal from the 60-ton furnace is delivered directly to the molds, without rehandling, on the Cleveland Tramrail system shown in sketch. The ladles ride on easy rolling carriers on smooth overhead track that is above and away from where the dirt is most serious. The carriers are propelled onto transfer bridges that provide complete coverage of the pouring floor. The bridges are provided with interlocks that lock securely with discharge points on the rail spurs, permitting the safe transfer of the carriers.

In the photo above two 1000-lb. ladles are poured simultaneously in the production of 200-lb. malleable castings. Each ladle is handled on an individual transfer bridge.

Mr. H. L. Arnold, President of the Terre Haute Malleable & Mfg. Corp., Terre Haute, Indiana, states: "Mr. W. A. Marschke of the Cleveland Tramrail Indianapolis Co., has saved us a considerable amount by aiding in laying out a tramrail system that provides us with the most efficient handling of all materials involved. We are well pleased with this engineering service."

All Cleveland Tramrail representatives — in 60 offices throughout the United States and Canada — are experienced and qualified to render similar engineering service. They are familiar with many foundry installations; how to apply Cleveland Tramrail equipment to improve production, cut costs and secure other important advantages.

Terre Haute Malleable built their overhead tramrail system up on a step-by-step basis. Each step had to prove itself advantageous. Today their entire plant is covered with Cleveland Tramrail. Because the system has been carefully planned and engineered, top efficiency is being secured.

GET THIS BOOK!

BOOKLET No. 2008. Packed with valuable information. Profusely illustrated. Write for free copy.

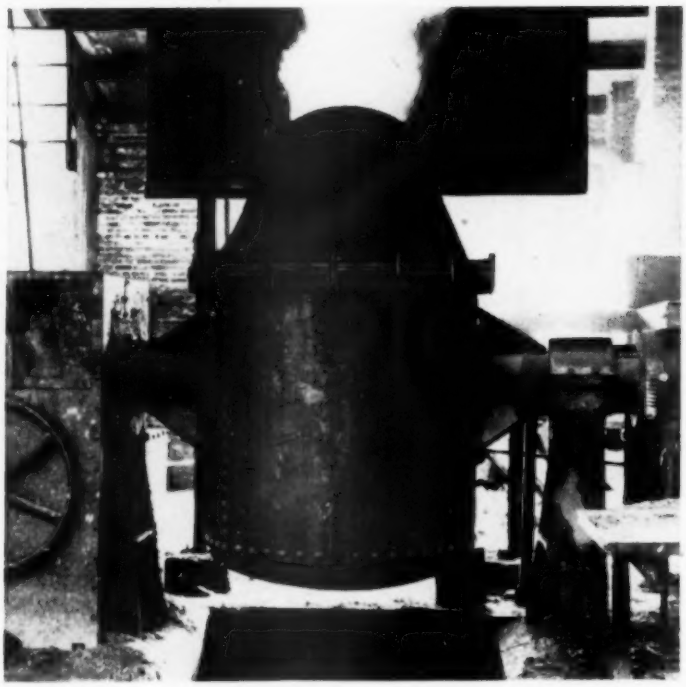
CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
1155 EAST 283RD ST. WICKLIFFE, OHIO.

CLEVELAND TRAMRAIL

OVERHEAD MATERIALS HANDLING EQUIPMENT

IRONTON CARO-LINE

A Monolithic Lining for...



SIDE BLOW CONVERTERS

ELECTRIC FURNACE BOTTOMS

FOUNDRY LADLES

The two most serious items of cost in converter operation are lining life and blowing loss. They are so closely tied together, an improvement in lining life always results in an improvement in blowing loss.

"Ironton Caro-Line" mixed with 50% of ganister of the proper grain size, lasts twice as long as ganister-clay mixtures in side blow converter linings. The steel is cleaner and losses from slag inclusions are practically eliminated.

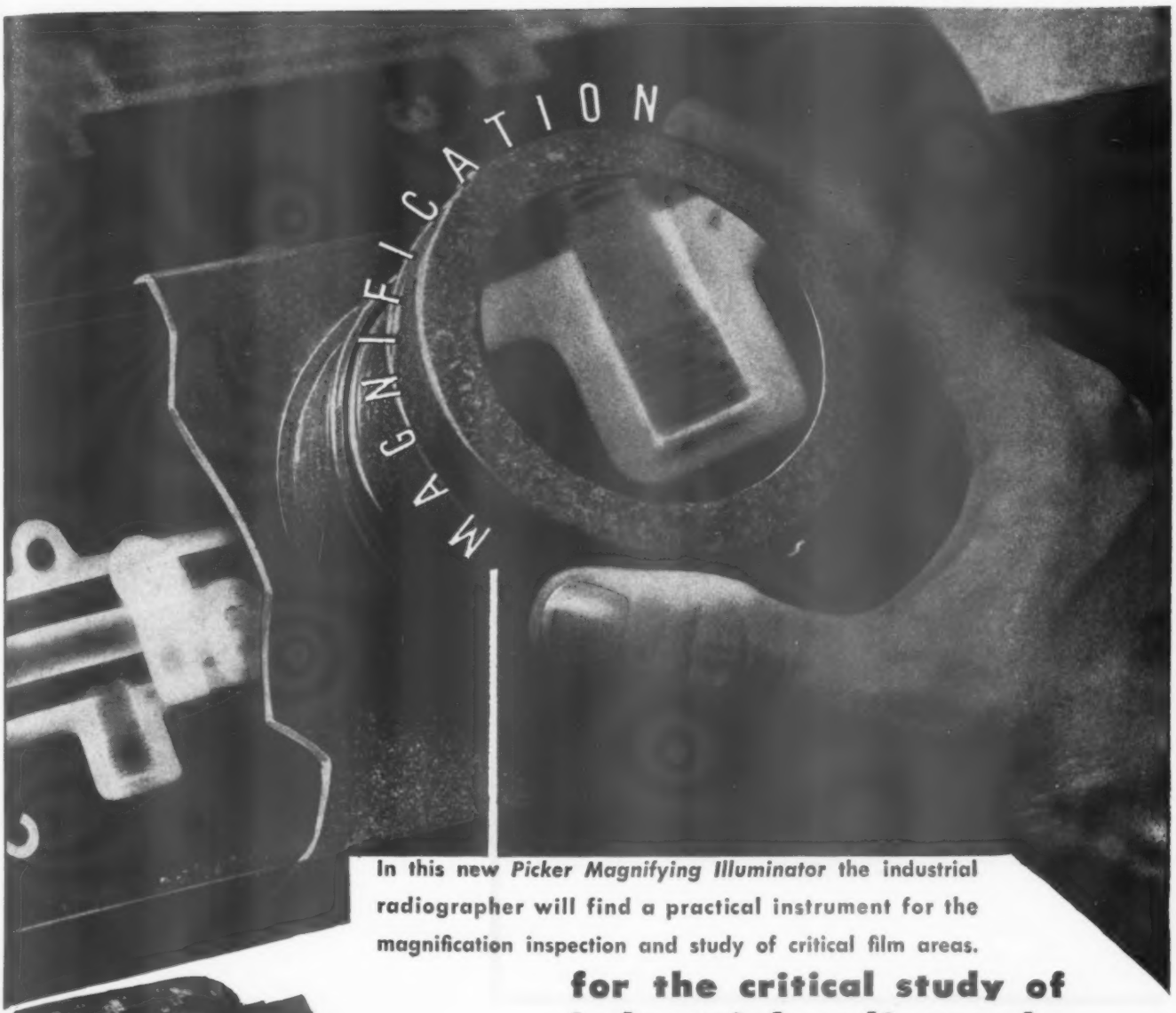
ASK US FOR ADDITIONAL INFORMATION

Address Box 209

THE IRONTON FIRE BRICK COMPANY

RELIABLE REFRACTORIES

IRONTON OHIO



In this new *Picker Magnifying Illuminator* the industrial radiographer will find a practical instrument for the magnification inspection and study of critical film areas.

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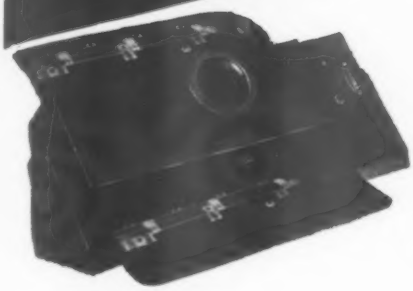
A magnifying factor of 2½X provides ample power for minute study of spot weld radiographs, or those exhibiting porosity, shrinkage cracks, gas inclusions, and similar faults. Picker Bulletin 1143 gives details, specifications, prices.



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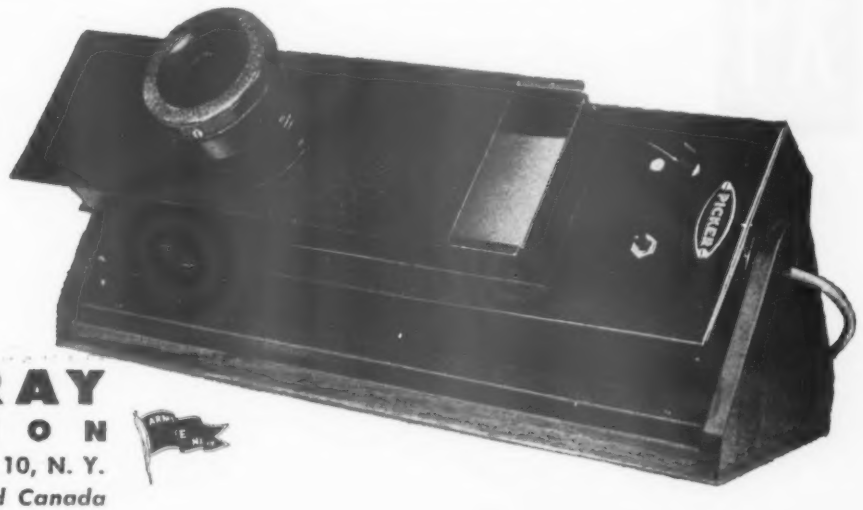

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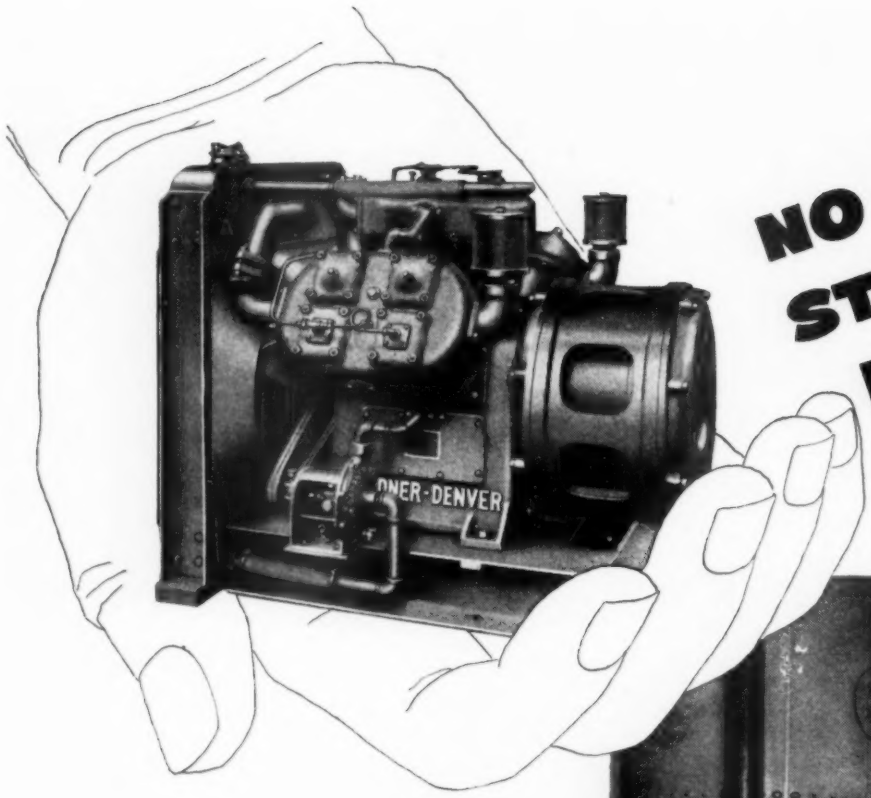

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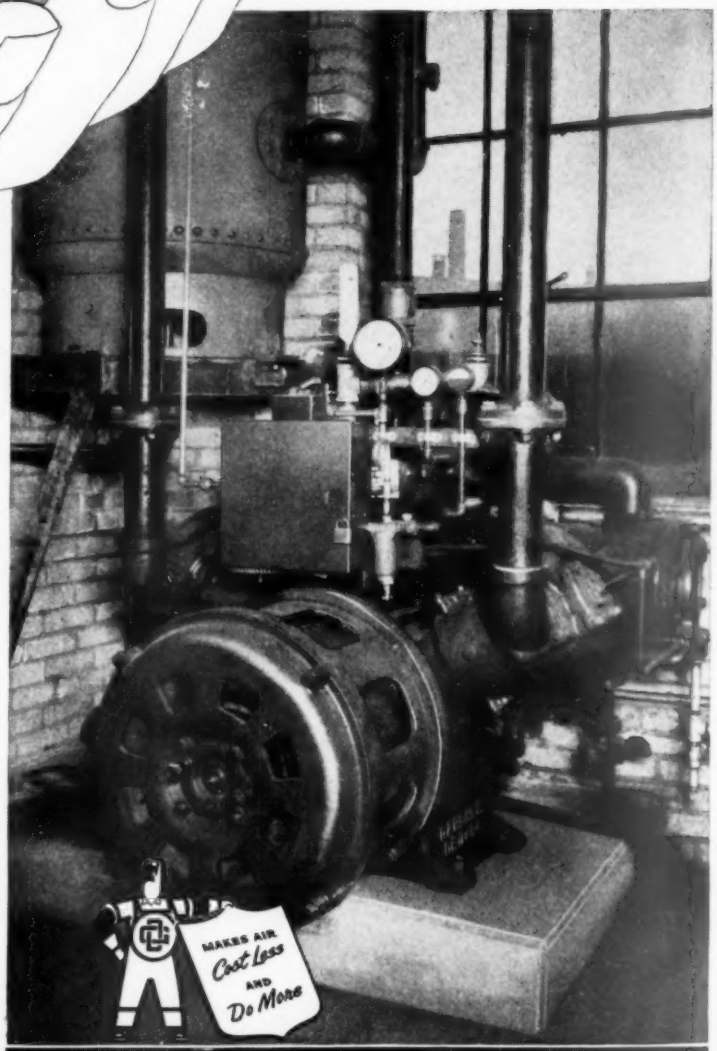

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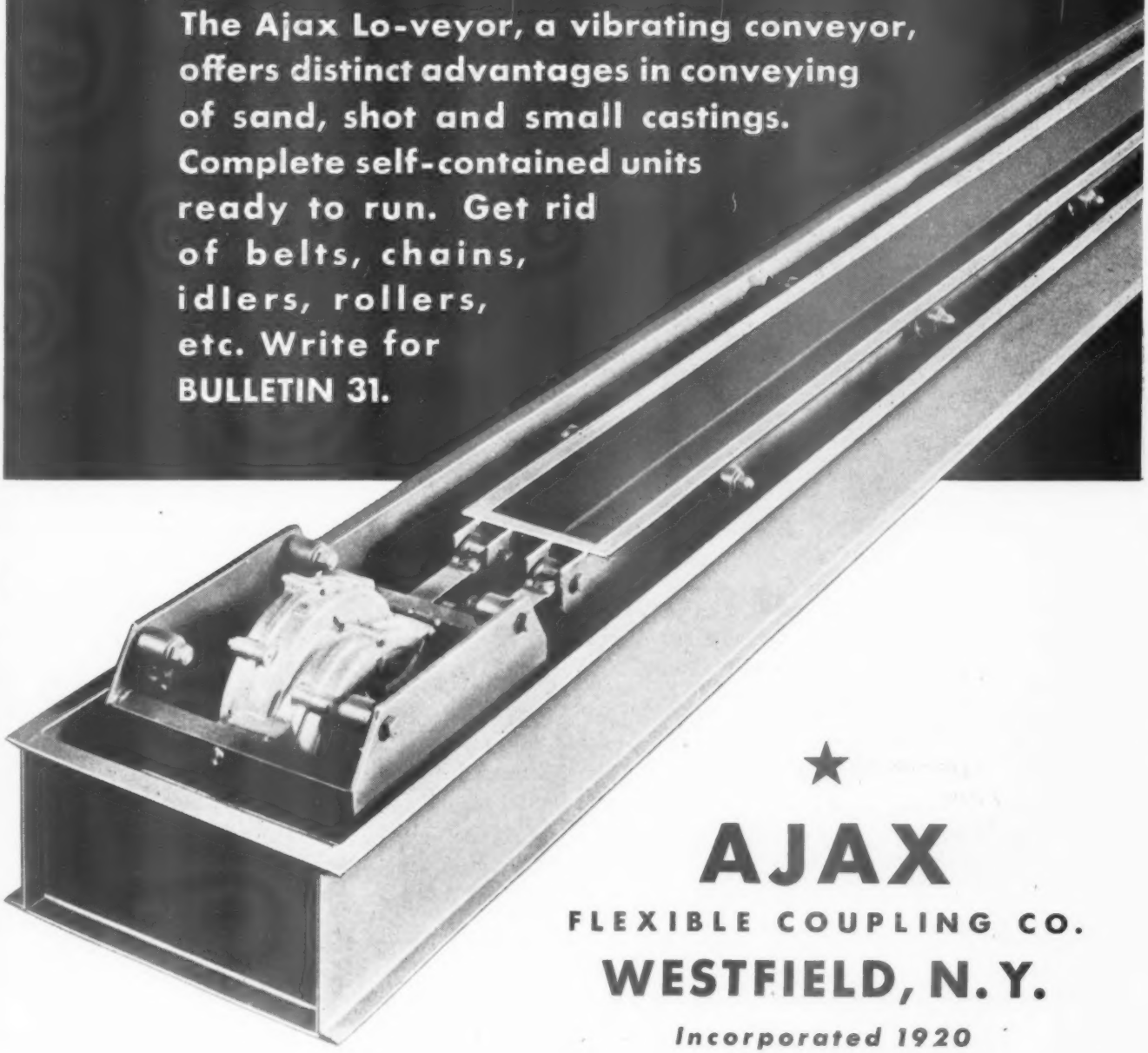

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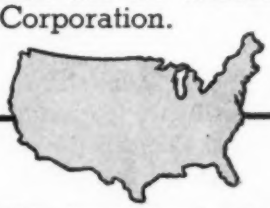

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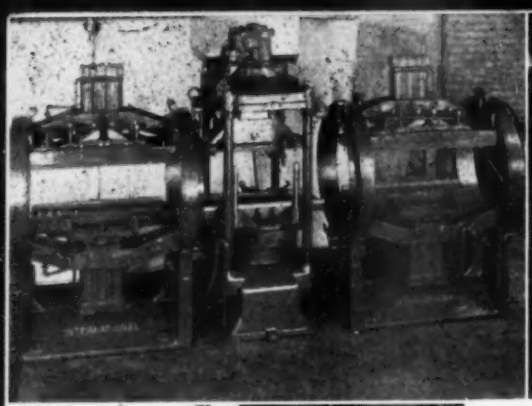
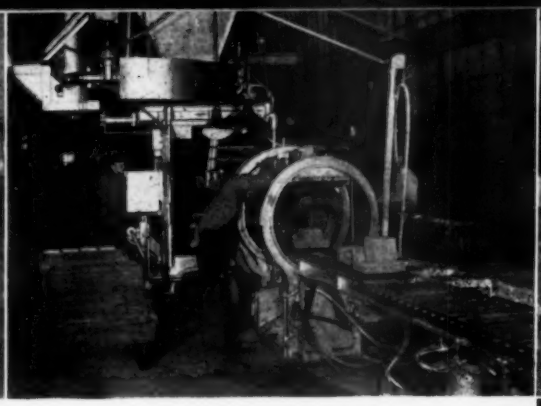

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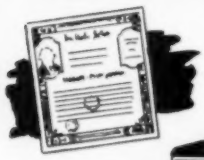

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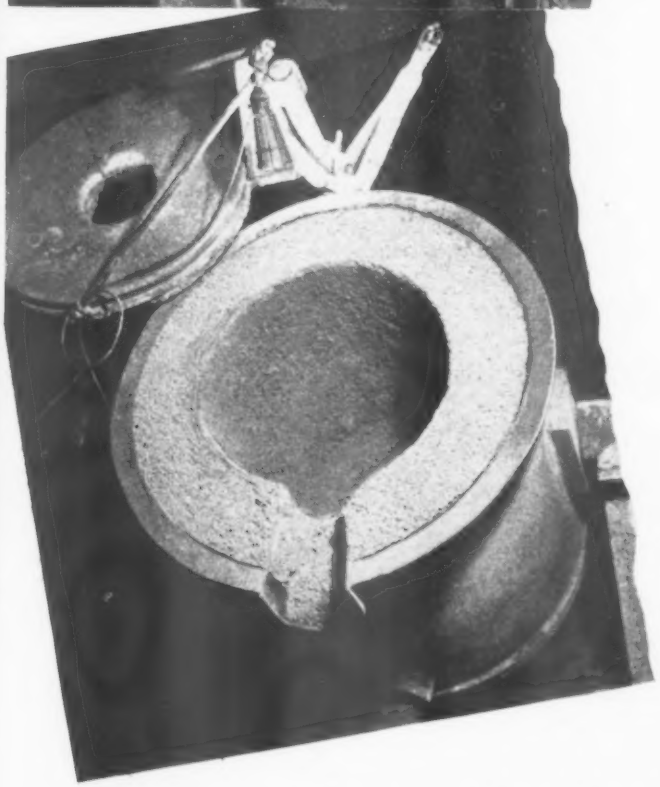

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New Code Provides Excellent Background For Better Industrial Housekeeping

SHORTAGES of manpower during the past summer and fall focused considerable attention on the foundry industry. Although shops were filled with a wide variety of work for practically every phase of the war effort, foundrymen were unable to secure workers in sufficient numbers to permit maximum operation of foundry facilities. An excellent example of the seriousness of the labor situation and its effect on war production is to be found in the malleable industry. Large orders for war equipment, such as trucks, which normally require huge quantities of malleable castings, coupled with a growing realization on the part of the armed services of the availability of malleable castings as engineering materials for many war jobs, created tremendous orders for that product. Because labor has not been available for much more than 70 per cent operation, it has been necessary to build new plants in areas where labor shortages are not critical, increase production in existing plants through the greater use of foundry equipment, and reconvert to the production of malleable some foundry capacity which previously had been converted to the production of other types of castings. Steel, gray iron and nonferrous foundries likewise have experienced great difficulty in finding and holding workers.

As the manpower shortages became more critical, meetings of interested groups were held, especially in the larger industrial sections. These meetings, generally called by government representatives and frequently ineptly handled, usually began the oftimes farcial deliberations with the general assumption that a foundry is an unpleasant place in which to work. In an effort to solve these manpower shortages by gaining certain concessions either for workers or the industry, government representatives, labor leaders and all too frequently the representatives of management dwelt at some length on the hot and dirty features of foundry work. That some foundries have not gone far enough in providing modern facilities for the added comfort of workers, including such features as wash, locker and rest rooms, also was emphasized. While these charges failed to accomplish the primary purpose of filling foundries with enough willing workers to permit maximum operation in the production of much needed war castings, the discussions, including such brilliant suggestions as the one recommending free beer and pretzels for all foundry workers, got front page attention in some of the metropolitan newspapers. Impressions of working conditions in the industry, created by these discussions and the accompanying unfavorable publicity, will live long after the present emergency has passed. A problem has been created which can be corrected only through use of modern equipment and adoption of progressive ideas regarding working conditions in foundries. Plans for improvement should be made now and as much of the program should be carried out as is possible under present restrictions on equipment and materials.

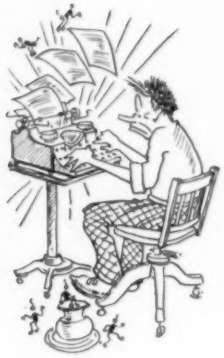
As an aid in that direction, the Industrial Hygiene Codes Committee of the American Foundrymen's Association recently has prepared and published the "Code of Recommended Practices for Industrial Housekeeping and Sanitation." This timely good practice recommendation is the latest in a series of seven codes prepared by that committee. As is outlined in the section devoted to scope, "this recommended good practice code describes the necessary fundamental engineering and construction information for the layout, design, installation and maintenance of wash, locker, rest, toilet and lunch rooms, and the general industrial housekeeping and sanitation facilities for the protection of health and safety of persons and the promotion of good industrial relations." The material contained in this report should be of immediate interest to every foundry manager.

Because the Industrial Hygiene Codes Committee is one of the most diligent of the many hard-working committees of the American Foundrymen's Association, a special note of appreciation is due the following members for splendid service to the foundry industry: James R. Allan, International Harvester Co., Chicago, chairman; S. B. Hansen, International Harvester Co., Chicago; E. O. Jones, Belle City Malleable Iron Co., Racine, Wis.; H. G. Gregg, Dodge-Chicago Plant, Chrysler Corp., Chicago; C. P. Guion, W. W. Sly Mfg. Co., Chicago; C. C. Hermann, Claude B. Schneible Co., Detroit; C. F. Larsson, American Air Filter Co., Chicago; S. McMullan, Western Electric Co., Cicero, Ill.; Nathan Lesser, Deere & Co., Moline, Ill.; R. W. McCandlish, Research Corp., Chicago; R. B. Parker, American Brake Shoe Co., New York; B. A. Parks, Crane Co., Chicago; John F. Tobin, American Blower Corp., Chicago; Miss H. Hansen, A.F.A., Chicago, secretary. Conferees on this code were L. C. Stokes, Department of Labor, State of Illinois, Chicago; and L. H. Streb, Dodge-Chicago Plant, Chrysler Corp., Chicago.

Frank G. Steinebach
Editor

BILL Celebrates S

PAT DWYER



THIS issue of THE FOUNDRY records a journalistic achievement unique in the field of business and technical paper publishing and probably unequaled in the annals of the entire publishing industry, for it marks 25 years of active collaboration on the part of Pat Dwyer, author, and Harry L. Richey, artist, in writing and illustrating the interesting and instructive series of articles entitled "The Adventures of Bill."

In establishing such an enviable team record, these two men have brought entertainment and knowledge of the intricacies of foundry practice to thousands of readers of this publication. Therefore it is fitting that the staff takes this opportunity to pay tribute to a job well done, and to express the hope that the frequently philosophical but quite often flippant comment of this famous foundryman, Bill, and the highly imaginative illustrations of his many and complicated activities, may continue in THE FOUNDRY for many years to come.

Pat Dwyer, creator of Bill and his sponsor for a quarter of a century, is one of the best known men in the foundry industry. Through his writings on almost every phase of foundry practice, his talks before groups in the industry, and his travels through the country, he has gained hundreds of friends in all parts of the world. In recognition of the immense good he has contributed to the industry through his writings, Mr. Dwyer was awarded a life membership by the American Foundrymen's As-

BY PAT DWYER

Drawings By RICHEY

TWENTY-FIVE years ago, or in other words for the benefit of the boys whose arithmetic is a trifle rusty, in the February, 1919 issue, that well-known character Bill made his initial appearance in the pages of THE FOUNDRY. On that occasion he stumbled in more or less by accident, but as he says himself in a recent interview, he liked the joint so well he moved in with his bag of tools the following month and with only two exceptions has taken off a heat each issue since that time. The only heats he missed were on Aug. 1 and 15, 1922, when his constant podner and cupola man, Harry Richey, was undergoing internal repairs in a hospital dry dock, and therefore was in no conditioin to charge the cupola or tap 'er out.

Where Bill was before 1919 is not—as the professor says—germane to the point at issue. Professors and other people I could name if pushed into a corner, or if offered a suitable consideration, are as adroit and as adept as a weasel in ducking, jouking and avoiding traps of all kinds. So far as I can see, no useful purpose would be served by a tiresome and long drawn out description of a man's birth and early life. Any person who craves obstetrical details has only to pick up almost any modern magazine or best selling work of fiction where the truly marvelous performance of introducing a new squaller into the world is good for at least one whole chapter.

For want of any tangible or reliable evidence to the contrary, it seems fairly reasonably safe to assume that Bill arrived by the usual Stork Route, Ltd., and marked C.O.D., FRAGILE, THIS SIDE UP, HANDLE WITH CARE, USE NO HOOKS.

In the far-away days of my youth, well-behaved little children were grouped in three general classes; (a) Those who believed that the latest addition to the family circle came in Granny's petticoat pocket; (b) Those who learned that little Snookums came in the doctor's black bag and (c) Those who were told that Papah, while out walking the dog one night, found the dear little stranger under a head of cabbage in the back garden.

It is hardly necessary to say that modern children regard these more or less ingenuous theories with mildly amused toleration. Any attempt on the part of embarrassed and helpless parents to introduce the petticoat pocket, the black bag or the cabbage head story is received either in polite and resigned silence or with "O nuts. Are you kiddin'?"

'Tis true that on several occasions Bill has referred to incidents in his brief and hectic school days, but since these incidents merely indicate his deep-rooted aversion to lessons and an even greater aversion to the unfortunate teachers who tried valiantly but vainly to pound any kind of knowledge into his hard little skull, they may be regarded as unim-

Silver Anniversary

HARRY L. RICHEY

sociation at the annual convention held in 1942.

Pat was born in Ireland in 1875, and at the age of 10 moved to Nova Scotia where he served his apprenticeship in the foundry. Following the custom of the day when a journeyman molder meant just that, he spent 5 years working in a number of prominent foundries in the eastern part of the United States and Canada. In 1901 he returned to Nova Scotia where he served for nine years as foreman of the iron, brass and steel foundries of the Dominion Iron & Steel Co., Sydney, and for a like period as superintendent of the Sydney Foundry & Machine Co. In 1919, shortly after the first of the "Bill" stories appeared, Pat joined THE FOUNDRY as its engineering editor.

Harry L. Richey was born in Steubenville, O., in 1893. While still a small boy his parents moved to Pittsburgh, where Harry attended public schools and later art school. He was connected with the art department of a large Pittsburgh store and then moved to Cleveland where he was engaged in art and engineering work for several years. In November, 1915, Harry accepted a position in the art department of the Penton Publishing Co., publisher of THE FOUNDRY, and later he was made head of the editorial art department. When the Penton Building was built in 1922-23, Harry was made building manager, and later he also was made purchasing agent.

A tremendous amount of work has been required to produce the series of "Bill" stories. In a period of 25 years, "The Adventures of Bill" has appeared in 456 issues, requiring in excess of 1120 printed pages. Pat Dwyer has written in the neighborhood of 1,400,000 words in creating the series, and Harry Richey has prepared approximately 1400 drawings. The early stories were published in book form some years ago under the title "Tales From the Gangway."

portant and therefore, quite properly may be omitted from the present veracious chronicle. This is my decision. Not his.

If he was asked for biographical details, I am inclined to the opinion that he would take more pleasure in describing real, and perhaps, imaginary adventures of his first 10 or 12 years than he would in going over actual and more important happenings in later life. To a rather remarkable extent he confirms one of the many witty remarks attributed to Mark Twain: "The older I get, the better I can remember things that never happened."

The author arrives with his pet cupola and bag of tools

At this point the presumably impatient reader is biting his nails and muttering: "O.K. OKAY! If you are afraid or ashamed or more probably too lazy to dwell on the early life and adventures of our hero, perhaps you would be good enough to tell us where, when and how you first laid your hairy paws upon him. How did you slip him into THE FOUNDRY. And finally, how in the er-ah-well, how did you manage to maintain amicable relations with him for the past 30 or 40 years and tap him at regular intervals for expression of opinions on an exceedingly wide range of subjects. How would you like to come across with some of that stuff? Hey, feller?"

Dear friend, I thank you for this touching display of quite commendable curiosity, even though I must deplore—

(*Continued on page* 154)

Structure Control of G

The authors describe practical methods by which foundrymen can take advantage of inoculants to produce better castings at reduced cost. This article, first of a series of three on the subject, discusses the difference between alloying and inoculation, basic function of inoculation, undesirable gray iron structure, and effect of cooling rate.

By R. G. McELWEE and TOM E. BARLOW
Vanadium Corp. of America
Detroit

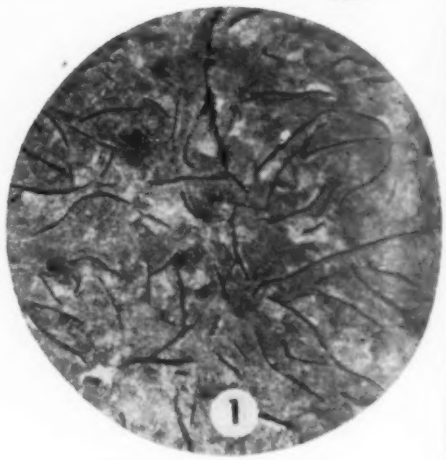


Fig. 1—Photomicrograph (etched structure, 100 magnifications) of normal gray iron structure composed of pearlite, ferrite, and randomly distributed graphite. The amount of ferrite present in this type structure can be changed readily by means of simple adjustments in the chemical analysis

Fig. 2 — Higher magnification (etched

GRAY iron foundrymen frequently ask, "Is structure control of gray iron advantageous to me?" This is a good question which should be given considerable thought, although it can be answered with a simple affirmative.

Another frequently asked question which requires considerable discussion is "How is structure control accomplished, and why?" The accepted answer to this question presupposes control of chemical analysis and controlled cooling rate of the individual casting. Carefully controlled melting practice is also an obvious pre-requisite to structure control of gray cast iron. Mechanical devices constantly are being developed and marketed to facilitate controlled melting practice. No foundryman today attempts to produce high quality castings without controlling the usual variables to the best of his ability. However, even these basic considerations have not proved sufficient to guarantee complete control of the structure of gray iron.

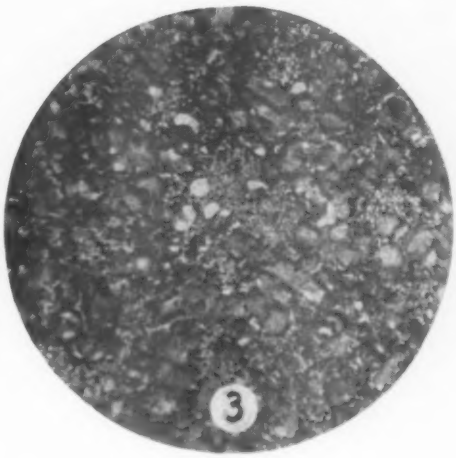
Reduces Structural Variations

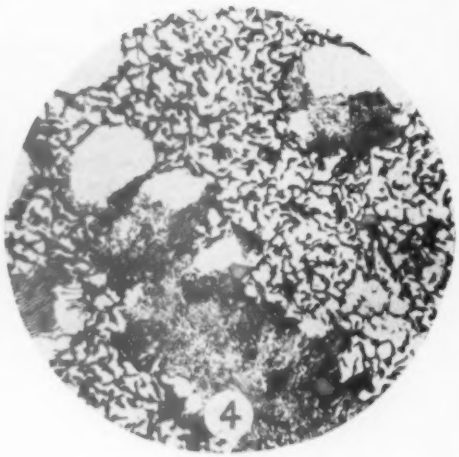
In this paper the expression "structure control" will be used to cover the process involving the use of some material for the purpose of eliminating or reducing variations in structure which are not due entirely to changes in analysis or cooling rate. At the present time the most widely accepted practice for accomplishing these desired results is known as *inoculation* or *ladle inoculation*. Although inoculants have simplified the production and structure control of quality gray iron castings, they are not the magic powders that we may all wish for at times. They must not be considered curealls even though they are utilized for a multiplicity of reasons and in numerous applications and types of iron widely different in character.

It is our purpose to discuss the practical methods by which foundrymen can take advantage of these widely publicized materials for the purpose of producing better castings at reduced cost. No attempt will be made to cover in detail the somewhat controversial and complex theories which are advanced to explain the success of materials used for ladle inoculation. This is because a knowledge of the theory of why and how these materials work is not essential in order to use them correctly and to advantage. It is only necessary to realize when they will work, what they will do, and what their limitations are. Fortunately, these factors can be definitely outlined, and the results can be checked with accuracy in the foundry.

Inasmuch as the terms alloying and inoculation are sometimes confused, it is first desirable to distinguish between them. There are two general differences. In the first place there is frequently a difference of purpose. The use of alloying elements such as vanadium, chromium, molybdenum, nickel, and copper frequently is specified by the ultimate user or fabricator to meet a particular physical requirement. For example, vanadium may be specified by the consumers of large die blocks to ensure maximum density and wear resistance under their particular conditions. Molybdenum plus chromium or vanadium may be specified for the purpose of obtaining maximum wear resistance in applications such as brake

Gray Cast Iron



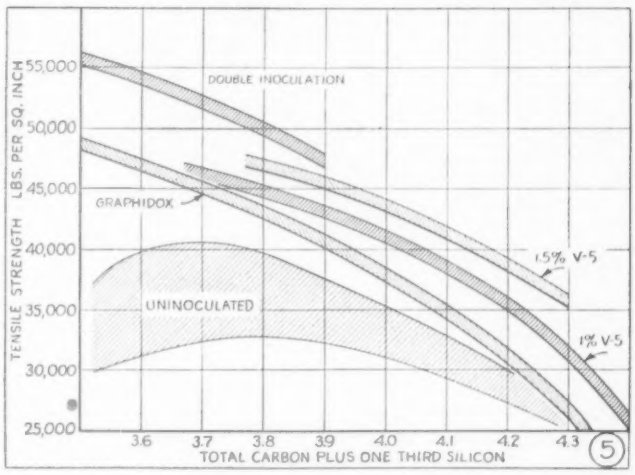


structure, 500 magnifications) of structure shown in Fig. 1 illustrating the appearance of "secondary" ferrite which occurs surrounding an individual graphite flake

Fig. 3—Photomicrograph (etched structure, 100 magnifications) illustrating the eutectiform or type D structure which occurs in cast iron in the absence of inoculation. The structure consists of pearlite, and primary ferrite in which is embedded extremely fine type D graphite

Fig. 4—Higher magnification (etched structure, 500 magnifications) of the structure shown in Fig. 3 illustrating the extremely fine, curly, or lacey graphite formation embedded in large areas of primary ferrite. The large "gray islands" are normal pearlite. This photomicrograph can be compared directly with Fig. 2 since the composition of both irons is identical. In fact both structures were found in the same test bar. This is the structure which is considered undesirable in high-strength gray cast iron and which it is possible to eliminate by use of inoculants

Fig. 5—Graph illustrating the effect of composition (as indicated by total carbon plus 1/3 silicon) on the tensile strength of gray cast iron using various types of inoculants. These curves indicate the increase in properties obtained from inoculation together with material reduction in the variation in properties for any given analysis. They also indicate the difference in the effective range covered by two types of inoculants (graphitizing and stabilizing). The double inoculation curve was made using both V-5 and Graphidox simultaneously which has proved unusually effective in low carbon-equivalent irons. These curves may have slightly different numerical values in some foundries, but furnish a very close approximation for the majority of gray iron foundries at present. Addition of alloying elements such as chromium, vanadium, molybdenum, nickel, and copper, changes the numerical value of these curves, but not the general trend



drums or clutch plates. Chromium may be specified with or without other elements to promote heat resistance. Again, alloying elements may be specified by the machine shop to facilitate machining of high strength castings. Whatever the reason, these alloyed cast irons usually are sold as such and on the basis of the contained alloying elements.

On the other hand, inoculation is seldom specified as such by the purchaser or consumer. The exception may occur when the inoculated irons are sold under a trade name. Even in this case, however, the purchaser rarely realizes that he is specifying inoculation of some type. Also, a large percentage of the inoculants used are for the convenience of the foundryman himself for the purpose of reducing scrap, reducing costs of raw materials, preventing waste of valuable alloys, eliminating variations in structure and properties which may be reason for subsequent rejection, relieving machining problems

and reducing the number of rejects due to hard spots or chilled corners. Therefore, inoculants frequently are used to facilitate the economical and consistent production of quality gray iron castings on which the foundryman may stake his reputation. For this reason, the producers of ladle inoculants work primarily with the producer of gray iron rather than the consumer of castings.

A metallurgical difference exists between ladle inoculation and alloying of gray iron which partially explains why they do not interfere with each other. As a matter of fact, most alloyed irons definitely are improved by inoculation, and inoculated irons are improved by judicious alloying. Alloying elements usually affect the properties of gray cast iron by their direct influence on either the graphitization of the critical temperature and transformation rates of iron. Their exact influence may be estimated from the knowledge of the actual percentage present in the finished casting. This is not true of ladle inoculants. It is impossible to determine from the chemical analysis the effect of the inoculant. In fact, it is usually impossible to tell from chemical analysis whether the iron was or was not inoculated. This is due to the fact that the effect of inoculation is not necessarily a direct function of the amount of material added. In fact it usually is believed that the effects of inoculants are not due to the direct influence of any element in solution in the iron, but upon a reaction, possibly of a mechanical or physico-chemical nature, which results from the addition of the ladle inoculant to the molten metal. In many cases, marked changes in the properties of gray cast iron are effected with an insignificant or imperceptible change in the chemical analyses. Roughly speaking, we might say that alloying elements affect the properties by their influence on the changes which occur after solidification while inoculation has its effect before solidification or at the time of solidification. Obviously then, inoculation and alloying of gray cast iron must not be confused or indiscriminately substituted one for the other.

Effects of inoculation on the mechanical and physical properties of gray cast iron are many and diversified, but its basic function is to control the graphite and matrix structures to an extent not possible by the control of chemical analysis alone. The resulting physical and mechanical properties are a direct reflection of this improvement in structure. The basic influence of inoculation is illustrated in Figs. 1, 2, 3, and 4.

Figs. 1 and 2 illustrate a so-called normal gray iron structure composed of pearlite, randomly distributed graphite, and free ferrite. This structure can be changed readily by simple adjustments in the chemical analysis. The addition of more silicon and/or carbon would increase the amount of free ferrite, and coarsen the graphite flakes. A reduction in the amount of silicon or carbon or both, and/or the addition of a stabilizing element such as chromium will reduce the amount of ferrite and refine the graphite flakes. All gray iron foundrymen will recognize those procedures as quite common practices with normal irons.

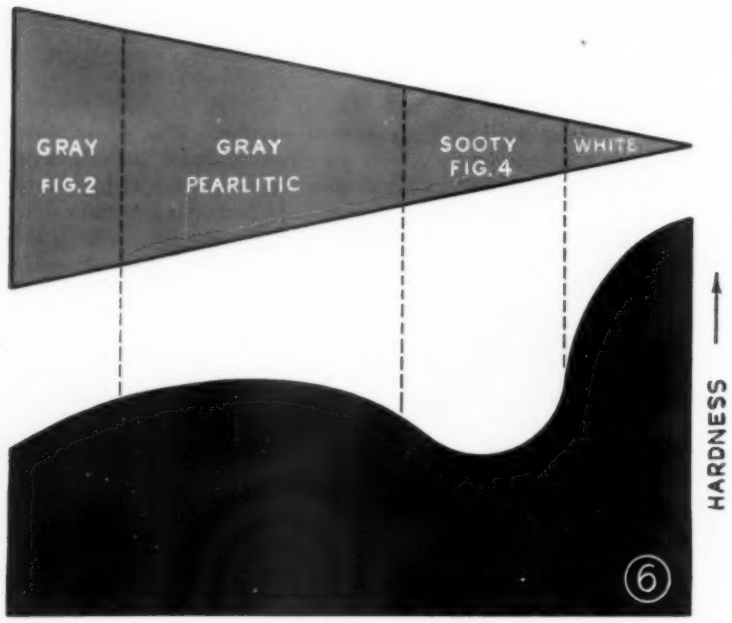


Fig. 6—Diagrammatic presentation of the effect of cooling rate as indicated by a wedge casting. This is a trend type presentation only, and is exaggerated for the purpose of illustration. The "sooty" low hardness area immediately back of the white iron or chilled tip includes the type of structure shown in Fig. 4 As the cooling rate is decreased, the iron becomes fully pearlitic with randomly distributed graphite. As the cooling rate is diminished further, free ferrite becomes evident, and the structure takes on the appearance of Fig. 2. Purpose of inoculation is to eliminate or reduce the "sooty" area, permitting a flatter hardness curve and greater uniformity of hardness under conditions of varied cooling rates

In Figs. 3 and 4 are illustrated the microstructures which are usually considered undesirable[1] in gray cast iron and which will be discussed later in connection with the effect of inoculation on physical properties. The iron illustrated is exactly the same composition as that shown in Figs. 1 and 2, but in this case the structure is made up of pearlite, eutectiform or, according to the graphite flake size chart of the A.F.A., type D graphite dispersed in large areas of ferrite. In this case the ferrite is frequently termed primary ferrite to distinguish it from the type of ferrite shown in Figs. 1 and 2. Actually, of course, ferrite is ferrite, but this structure shown in Figs. 3 and 4 has such a different appearance and occurs at a different cooling rate and under different conditions so that it is given a distinguishing name. Since the iron in Figs. 1 and 2, and in 3 and 4, are the same composition, it is obvious that a simple change in composition or chemical analysis will not change the structure from one type to the other. The most widely accepted method of converting an iron from the type shown in Figs. 3 and 4 to the type shown in Figs. 1 and 2 is by ladle inoculation. This is the prime purpose and function of ladle inoculation, and most of the advantages of this treatment are direct reflections of the change from one type of structure to the other together with the change in the graphite flake size.

Unless foundrymen take frequent photomicrographs of their irons they may not be cognizant of the frequency with which these undesirable (*Please turn to page* 177)

Factors in the Production of quality castings

By WILLIAM G. REICHERT

QUALITY, dependability and uniformity in castings are factors which must be considered if any foundry is to survive as a post-war enterprise. At the same time, certain other steps must be taken if future progress of the foundry industry is to be promoted. Very often we must improve the quality at no additional cost, or maintain the same quality at no increased cost. We must develop new applications for castings and new alloys or metals for specific jobs. Likewise we must establish the dependability of castings by means of proper methods for controlling operations from the raw material state to the final finishel product.

Many foundrymen believe that the quality of their castings begins and ends in the foundry, but merely a cursory examination will show that necessarily it must begin with the design. A number of different factors control quality, but only a short description can be given here of many of these items. In general, the quality of castings will depend on the design, the pattern, gating and risering, melting operations, molding and core operations, cleaning and finishing, and management.

Practically every manufacturing process has its limitations, and foundrymen should not accept work which is designed improperly and which obviously cannot be produced satisfactorily on a commercial basis. However, some slight changes in design may help.

Follow Basic Principles

A number of well-recognized basic principles will aid in arriving at a properly designed casting. Very often merely discussing a design with the engineer and obtaining his co-operation will change a casting from a high-cost, rather impractical combination of bosses, ribs, and flanges to a more simple design of casting which the foundry can produce readily at a lower cost and with the assurance that the resulting part will meet every requirement.

The amount of draft required depends upon the shape and size of the casting method of production and whether molded by hand or machine. Machine molding will require a minimum draft.

Parting lines should be made as even as possible to facilitate molding. Avoid irregular and multiple parting lines, because they tend toward dimensional irregularities, increase molding and cleaning cost and offer a poor surface quality.

Locating points and jig spots are important items frequently neglected until the castings are made.

An attempt should be made to design all sections in a casting with a uniform thickness; abrupt changes in section are not desirable. A uniform section equalizes the rate of solidification and simplifies both the gating and the feeding. Non-uniform solidification sets up internal strains, causes shrinkage cavities and cracks, and reduces strength. Wherever uniform thicknesses are impossible the changes in a section should be made with a gradual taper rather than abruptly.

Bosses and lugs are common to all castings and if not properly designed frequently lead to foundry difficulties. When used they should conform to the thickness of the adjacent section as closely as possible. This may be accomplished by a riser acting as a feed for the boss, or a metal chill may be placed against the face of the boss. Such a chill tends to equalize the rate of solidification and make it more or less identical with the thin section of the casting. Bosses frequently are cored in order to maintain uniformity of the metal and thereby simplify foundry practice.

WILLIAM G. REICHERT

This is the first of three installments comprising an exchange paper prepared by Mr. Reichert and presented before the London Branch of the Institute of British Foundrymen, also before the Metropolitan Chapter of the American Foundrymen's Association. Mr. Reichert, a foundry manager and metallurgist of 25-years' experience, heads the W. G. Reichert Engineering Co., Newark, N. J.

Adequate fillets at all intersections will reduce scrap due to shrinkage and cracks, but we must also remember that the fillets should not be so large as to increase metal sections and create a non-uniform section.

Square corners are to be avoided wherever possible. A sharp corner may readily develop a minute check that will extend into a crack, particularly in the vicinity of the gates where the metal cools last. In cases of this kind, losses due to cracks will be greatly lessened if the corners are slightly rounded off.

When a design of a cast structure becomes very complicated or intricate it is suggested that it be broken up into parts, so that they may be cast separately and then assembled by welding or other means.

Ribs are used primarily to reinforce sections of the casting. The rib sections should have a fair relation to the casting section. Thin ribs, because of rapid cooling, may set up casting strains and cracks. Staggered ribs are usually designed to avoid inter- (*Please turn to page* 199)

PRECISION C

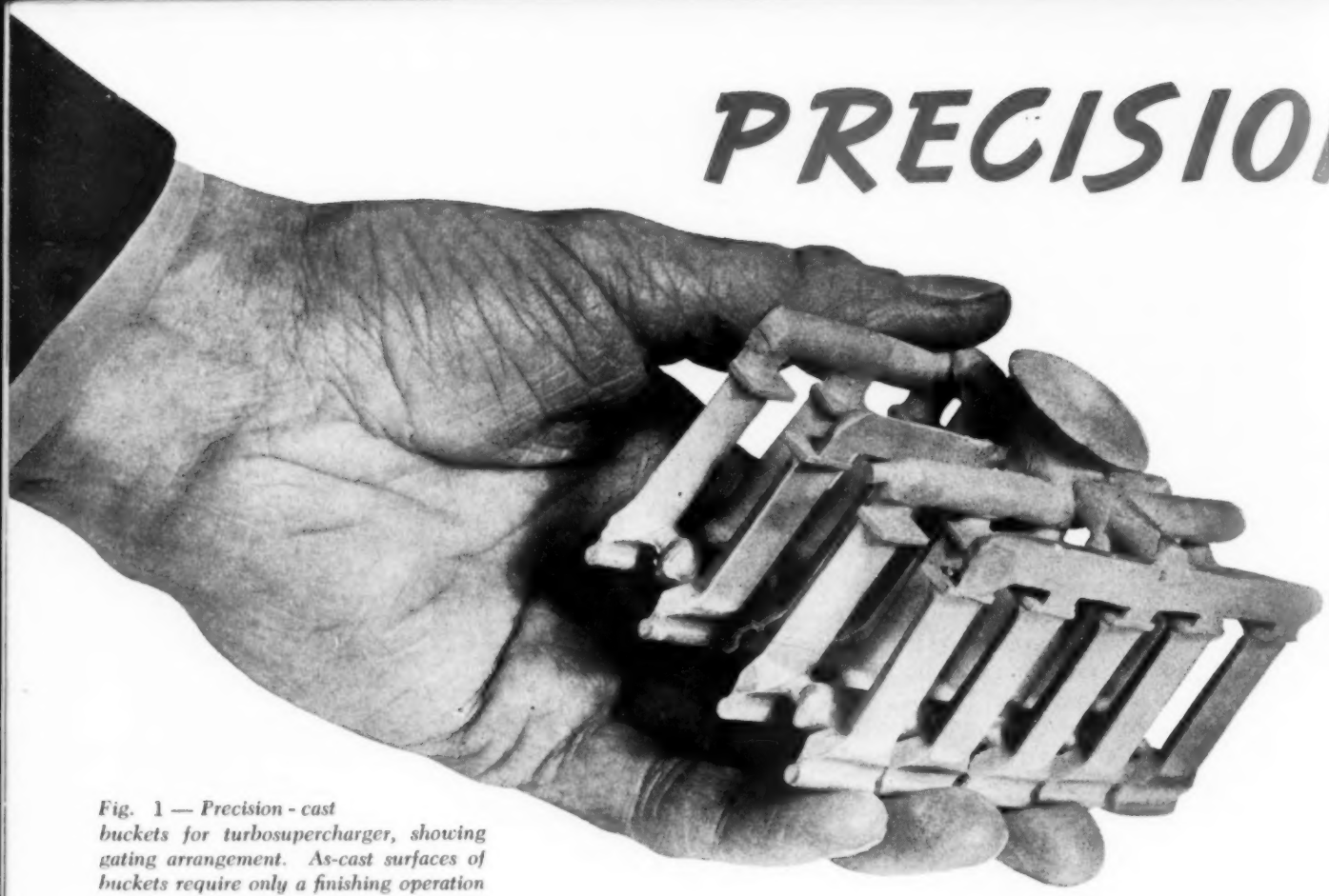


Fig. 1 — Precision-cast buckets for turbosupercharger, showing gating arrangement. As-cast surfaces of buckets require only a finishing operation

APPLICATION of precision casting, utilizing either centrifugal or pressure methods, to the production of precision parts made from heat and corrosion resistant alloys is a recent development which promises to provide an easy method for the fabrication of parts which at present demand too much machine or hand work, or both, for economical and efficient production.

Ever-increasing demands for high strength and corrosion resistance in metals for turbine and supercharger applications forced metallurgists to resort to the use of highly alloyed steels, even to the extent of producing alloys devoid of iron. These alloys proved to have adequate performance qualities, but many of the best were not forgeable, and could be machined only with great difficulty. Being confronted with suitable but unworkable materials, the metallurgist was faced with the problem of developing some method capable of producing the required parts on a quantity production basis, and having the required quality and precision.

The only field of endeavor in which high-melting metals had been precision cast was in the dental and jewelry trades, but this technique utilized, in general, metals and alloys which present no severe melting problems, and was concerned with castings weighing but a fraction of an ounce. However, the fundamental idea underlying the technique used in these trades was sound, and it appeared that the method might be developed to larger scale production and with much larger castings. Certainly the intricacy and accuracy of reproduction obtained in the jewelry trade, and the precision and accuracy obtained in the use of high melting alloys in the manufacture of dentures, gave ample promise of the possibility of developing these methods to larger scale operation.

During the past 1½ years these methods have been developed and expanded to the stage where castings of bucket blades, nozzles and other supercharger and turbine parts of highly complicated design now are being produced in commercial quantities from alloys which could not be fabricated economically into the desired sizes and shapes by normal means. Furthermore, they are being cast at but a portion of the fabricating cost of alloys formerly used for similar applications having less stringent requirements.

The basic method is not new, and has generally been known as the *lost wax* or *investment* method of centrifugal casting. There are many variations of the basic method which have been developed for special purposes, but fundamentally the method consists of producing a replica of the desired object from wax, plastic, or some other material which can be melted or vaporized away without leaving a residue of any kind. This replica, or pattern, must be so designed that the final casting, made in the mold which is formed around the replica, has the desired size, shape, and surface finish. Such design factors not only must consider the volumetric changes of the casting itself during cooling, but also must involve suitable compensations for any dimensional changes which may occur in the wax replica and the resulting mold.

In production quantities, the wax patterns are made by carefully casting the wax into highly polished and precisely built metal molds, thus insuring the strict adherence to size, shape and finish. For less precise work, investments (quick-setting, non- (*Please turn to page* 203)

CASTINGS

By L. L. WYMAN
Research Supervisor
and
D. BASCH
Special Assistant
War Metallurgy Committee

This report by the War Metallurgy Committee was prepared to fill the need for a general review of the field of precision casting of metals, and was reprinted by the Office of Production Research and Development, WPB. The authors are associated with the General Electric Co., Schenectady, N. Y., and the photographs are reproduced through the courtesy of that company

Fig. 3—Worker shown assembling aircraft supercharger impeller on shaft driven at over 20,000 revolutions per minute by impingement of exhaust gases on turbine wheel at right. Wheel bucket blades are precision cast to close tolerances. Various types of turbine blades are being cast successfully by the precision method either individually or as part of a complete rotor

Fig. 4 (right)—Sketch of centrifugal unit for precision casting. Individual molds are assembled with gates leading radially toward central pouring gate at hub

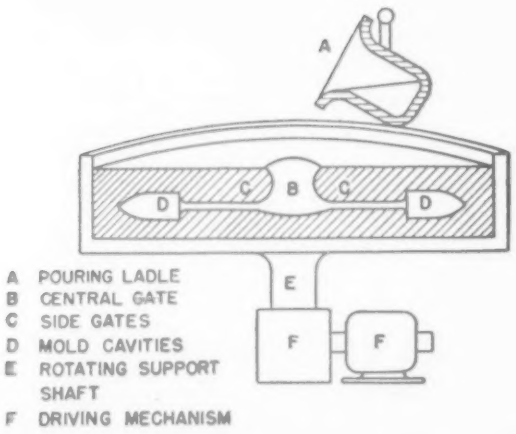
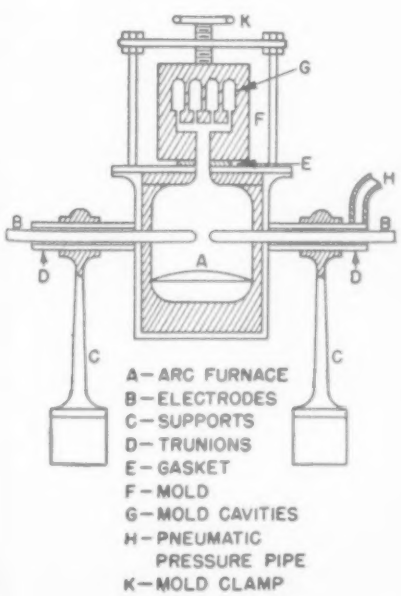
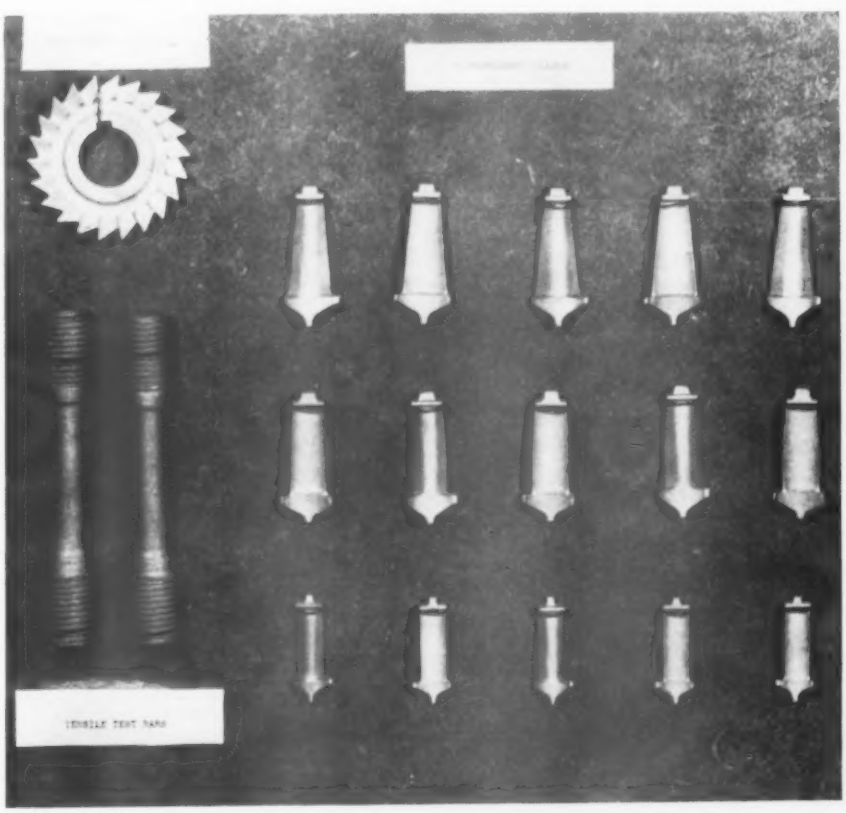


Fig. 5 (right below)—Examples of various precision castings, including supercharger blades, milling machine cutter and tensile test bars

Fig. 2 (below)—Pressure casting unit consisting of totally enclosed indirect arc furnace mounted on trunnions and capable of being inverted. After furnace charge is melted, mold is clamped in position and unit is inverted to permit metal to run into mold





The War Metallurgy Committee recently made available a lengthy report entitled "An Engineering Approach to the Selection, Evaluation and Specification of Metallic Materials," by H. W. Gillett, Battelle Memorial Institute, which contains considerable material of interest to producers of castings. With that in mind the editors of THE FOUNDRY have prepared an abstract presenting the most pertinent data relating to castings. This is the first of four installments. The second section will appear in March.

Abstracted from a report

By H. W. GILLETT

Selecting Evaluating and Specifying METALLIC MATERIALS

Introduction

IN THE preface to the report, "An Engineering Approach to the Selection, Evaluation and specification of Metallic Materials," prepared recently for the War Metallurgy Committee, it is pointed out by Clyde Williams, chairman of the committee, that the original attempt was to prepare a general report on conservation and substitution of metals. However, the continually changing situation and development of new alloy combinations were such that consistent recommendations could not be made, and it became clear that a more useful treatise would be one which would aid the engineer in selecting a metal or an alloy for a specific use.

The report chiefly was prepared and edited by H. W. Gillett. Successive drafts were criticized by S. D. Heron and one or more of the later drafts by Zay Jeffries, P. D. Merica, John Johnston, R. F. Mehl, J. H. Critchett, G. F. Jenks and V. N. Krivobok (all nine being members of the committee), as well as by J. B. Macauley, J. L. Gregg, S. Epstein, Val Cronstedt, F. R. Shanley and other engineering staffs of several aircraft corporations. H. C. Cross, R. W. Dayton, H. W. Russel and L. R. Jackson and other members of Battelle Memorial Institute staff actively collaborated in drafting and revision. The report covers so much ground and so many conclusions are based upon recent innovations in metallurgy that it does not purport to reflect the views of the War Metallurgy Committee, or even of the men who reviewed or criticized it. Primary purpose of the report is to be helpful to engineers and others responsible for selection of engineering materials, and provide both engineer and metallurgist with the basis for a better understanding of each other's problems and proficiencies.

Conservation and Substitution Necessary

In the introduction to the report S. D. Heron states that shortages of alloying elements for steel and of nonferrous metals of construction have brought sharply to the fore the problem of conservation and substitution of engineering alloys. The design engineer is faced with the necessity of specifying a new material in place of an old one which experience has proven reasonably adequate for a given purpose. He wishes to make the substitution as promptly as possible, but he must have such general information, or make such specific tests, as will afford satisfactory evidence of adequacy.

In such a case the engineer has to rely on the metallurgist and the testing engineer for figures, but he still has the responsibility of interpreting the figures and making the final decision. All three may tend to be overconservative, and some engineering improvements have come when the engineer, in desperation, tried materials that the metallurgist would not recommend on the basis of his usual methods of evaluation.

One trouble is that each lacks the background of the other and often is not too conversant with the technical terminology used by the other. Seldom do the metallurgist and the testing engineer have full knowledge of performance and failure records or full appreciation of the conditions of normal and abnormal service. The design

engineer does not have intimate knowledge of the metallurgical behavior of unfamiliar materials and cannot predict behavior as well as the metallurgist can. Often the metallurgist, who commonly reports to the manufacturing department, lacks the perspective to strike a proper balance between manufacturing difficulties and engineering performance.

It is seldom that one individual is an expert in design, in metallurgy, and in testing, and it is not desirable to take the time of a good designing engineer to turn him into a poor metallurgist or vice versa. There is a too prevalent desire among designers for a reference book to which they could turn for the way out of any particular dilemma in choice of materials, without bothering to think the matter out or to take counsel. This cookbook attitude is a very dangerous one and should not be catered to. However, it seems reasonable that the designer should ask what usual tests he should have applied to a substitute material and how far he may properly go into the interpretation of the test results. It is reasonable also that the metallurgist should ask the designer for precise information on the type and severity of the service to which the material would be put.

A common meeting ground for such consultations among design engineers, testing engineers, and metallurgists, would be better prepared if all had in mind some of the principles of the evaluation and application of metallic materials.

It is appreciated that in many cases knowledge is still too hazy and the proper tests still too undeveloped to allow precise solution of all these puzzles, so that evaluation and interpretation often become matters of personal opinion. Expression of personal opinion can be convincing if adequate basis is advanced, and in any case, can be usefully thought-provoking.

Some of the puzzling features of the substitution problem in regard to metals may be listed as follows:

How far may chemical composition be trusted to connote the existence of the desired mechanical properties? For example: Does a piece of steel that meets a given NE or SAE specification necessarily fall within a narrow range of properties, or is each heat a law in itself so that its mechanical properties should be determined individually?

Hardenability is being used as a major criterion of equivalence between SAE and NE steels. How far does this equivalence extend?

Engineers generally desire toughness, supposed to be measured by tensile ductility, even though that quality may not have opportunity to be displayed in the actual performance of the part. Conversely, some thoughtful metallurgists do not hesitate to state that many designers are "ductility crazy". Under what conditions are each of these attitudes justifiable?

Conditions Do Not Agree

Fatigue resistance admittedly is important but the fatigue values are usually given in terms of polished specimens with an absence of notches difficult, sometimes impossible, to obtain in practice. In the service history of parts subject to repeated stress, especially in aircraft engines, occasional occurrence of a few hundred cycles of overstress, perhaps accompanied with impact, may occur. A steel possessing *guts* may resist the overstressing while one equally satisfactory under normal conditions may fail in short order. How can the presence or absence of *guts* be evaluated?

A broader phrasing of a broader problem is *reliability* which goes back to the feasibility of manufacturing and processing a material with a minimum of defects. What means have we of predicting reliability in service?

Brittleness like that of glass at normal or at subnormal temperature is certainly undesirable, yet aircraft engine exhaust valves of only 0.5 foot pound Izod at room temperature have been used without serious trouble. High impact figures used to be demanded in crankshafts and were thought to be necessary (*Please turn to page* 207)

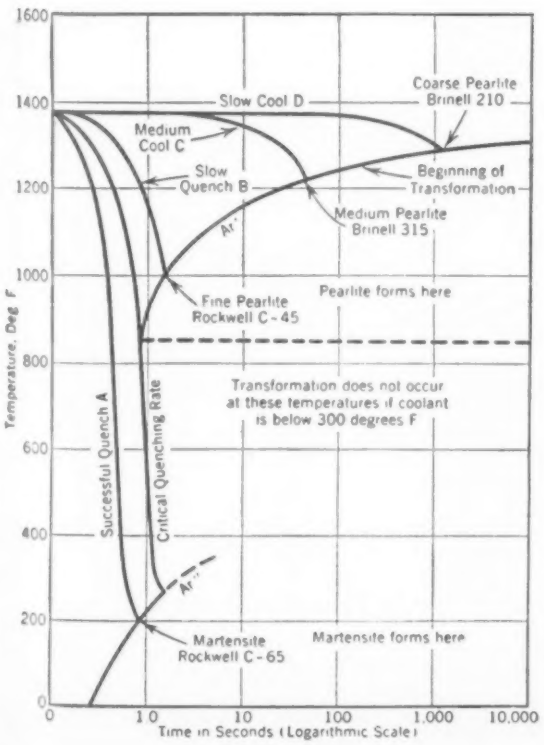
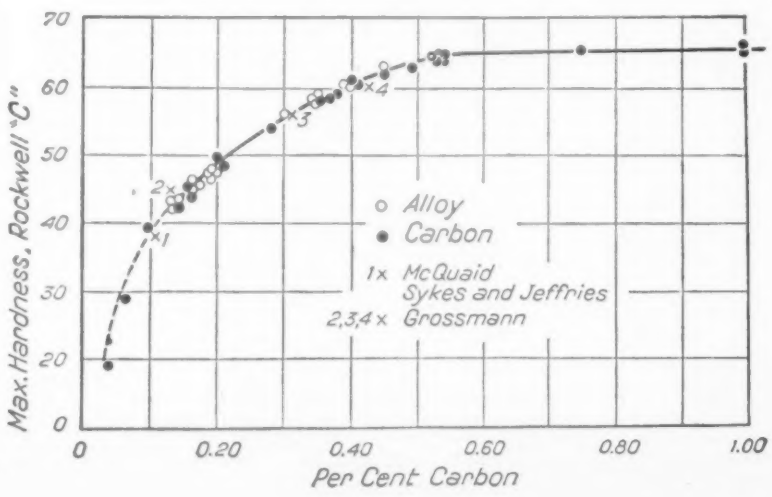


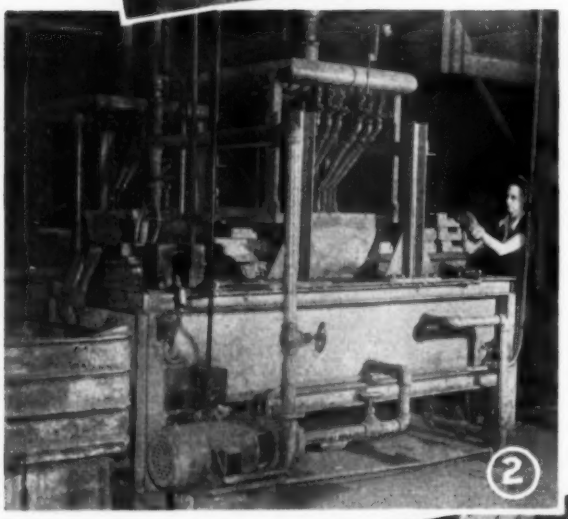
Fig. 1[3] (Left)—Effect of rate of cooling on structure and hardness. Fig. 2[3] (Below)—Quenched hardness versus carbon content



Saginaw Malleable makes STEEL

STEEL castings are made on jolt-squeeze-strip molding machines located along a mold conveyor line at Saginaw Malleable Iron Division, Saginaw, Mich. Sequence of the machines is five for producing drags followed by five for making copes. Only four of each are in use at one time, the other two being held in reserve for pattern change or breakdown. The machines are controlled by an automatic push-button device which operates a timing mechanism. That mechanism controls the number of jolts, the squeeze, and the stripping operation. Consequently, all the operators have to do is to fill the flask with sand, push the button, and wait until the mold is stripped from the pattern. Then they carry the mold to the conveyor, a matter of a couple of feet.

The mold conveyor is the car type with plates for carrying the molds mounted on top. The plates are located on 40-inch centers, and the conveyor is 160 feet long from center to center of the end turns. The conveyor



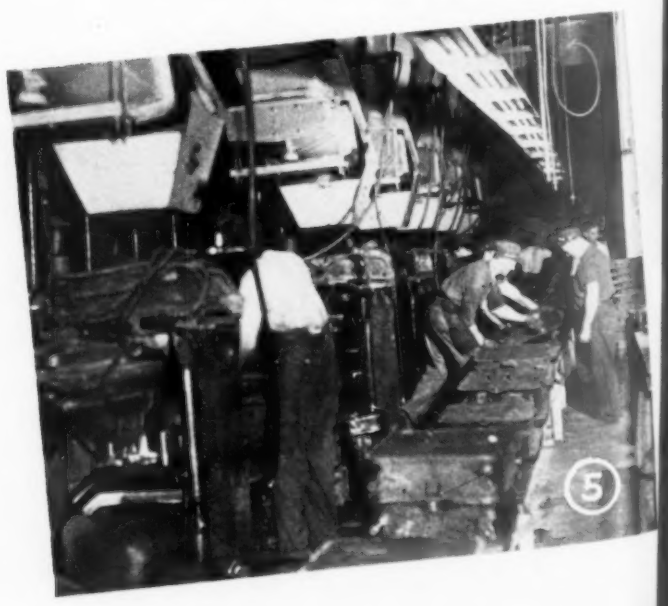


Fig 1—Core setters on the outside of the molding line placing cores in position preparatory to closing the molds. Fig. 2—Surface hardening of the working face of the tank treads is accomplished in special machines using a combination of natural gas and air, fired in special burners. As soon as the metal reached the desired temperature, it is quenched automatically. One woman operates four machines. Fig. 3—Sand from the storage hoppers drops on a cross belt which carries it to the mixers. Fig. 4—After the molding sand has been prepared it is carried to the molding station hoppers and distributed by plows. Fig. 5—View taken along the molding line showing arrangement of machines, and hoppers. Core setters work in the aisle at the right. Fig. 6—Oil quenching a load of castings

...CASTINGS

By EDWIN BREMER
Metallurgical Editor
THE FOUNDRY

This is the concluding article of two on steel foundry practice employed at Saginaw Malleable Iron Division. It discusses sand handling, heat treatment and other features. The first article appeared in the January issue.

travels at the rate of approximately 24 feet per minute. Cooling time for molds and castings from pouring to shakeout is about 9 minutes. Height of the plates above floor at the molding machines is such that they are at the same level as the platen of the machines. Consequently, little effort of the operators is required in placing the molds on the conveyor. As a further refinement of that arrangement, the conveyor dips at the cope machines so that the top of the drag is level with the molding machine platen. In the case of the drag machines the conveyor is 24 inches above floor level, while at the cope machines it is only 14 inches.

Cooling side of the conveyor across from the molding machine side is depressed below the floor and travels in a tunnel. This permits movement of cores, etc., to the operating side without interference. Molds are poured from a traveling platform which is synchronized with the movement of the mold conveyor so that the man pouring the metal can give his undivided attention to that main job.

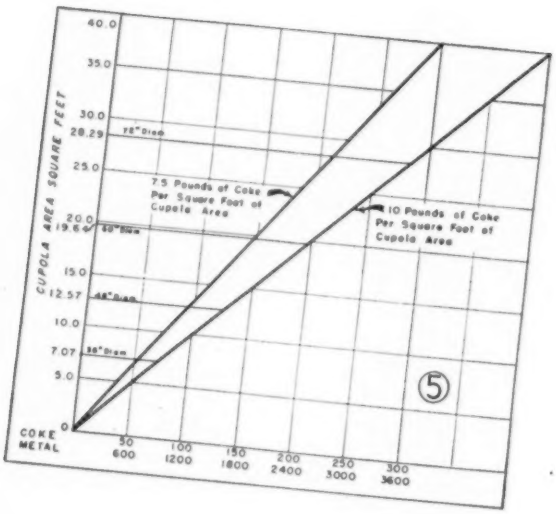
Flask return conveyor and mold conveyor travel also are synchronized so that the completed mold is lifted from the machine and placed on the conveyor, an empty flask is right at hand for the operator.

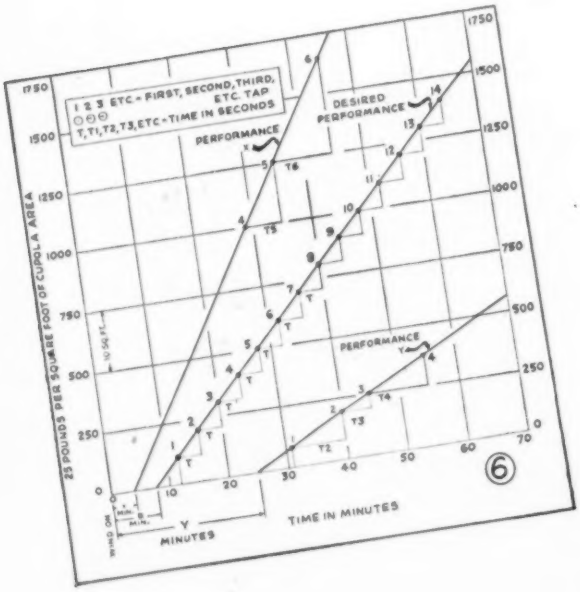
Base sand used for molding is a washed and dried silica sand of the Ottawa type with an A.F.A. fineness of 50. The sand is bonded with bentonite which is added partially as a slurry and in the dry form. Moisture content of the sand is held to 2.3 per cent plus or minus 0.1 per cent, and samples are taken every hour for determination and control. Green compression strength is between 5 and 6 pounds per square inch, and the permeability ranges from 240 to 280. No facing sand is used in this operation.

Sand is handled in a continuous system which has given excellent results. Shakeout sand from the vibrating screen passes into a rotating drum cooler which is 8 feet in diameter and 20 feet long. That unit is located at the bottom of a tower 126 feet (*Please turn to page* 191)

Duplexing in MALLEABLE IRON Production

By DONALD J. REESE, Chief
Iron & Steel Manufacture Section
Metallurgical & Conservation Branch
Steel Division, WPB, Washington





THE CHEMISTRY of the cupola charge is of the operator's own choosing. The cupola melting process modifies this chemistry, showing increases in carbon and sulphur and decreases in silicon and manganese. The nominal loss of silicon in cupola melting is 10 percent of the amount present. Loss is less than 10 percent when the cupola air supply is preheated. The loss is more than 10 percent (with room temperature air) when an appreciable portion of the silicon in the charge is in a concentrated form of silicon as ferrosilicon or silicon briquets, and when this concentrated silicon is divided finely. For example, if the charge contained 5 pounds of 50 percent ferrosilicon, the silicon loss in melting would be greater if 10 to 20 pieces of ferrosilicon totaling 5 pounds in weight were charged than if one 5-pound chunk was used.

Nominal loss of manganese in cupola melting is 20 percent of the amount present, but the actual losses may vary from considerably less than 20 percent to considerably more than 20 percent if preheated air or appreciable amounts of concentrated manganese are used in finely divided form. The sulphur increase in cupola melting is nominal at 0.03 percent (that is an 0.06 percent sulphur in the charge will result in an 0.09 percent sulphur in the product) but the actual increase may be a great deal more, depending on such factors as amount of sul-

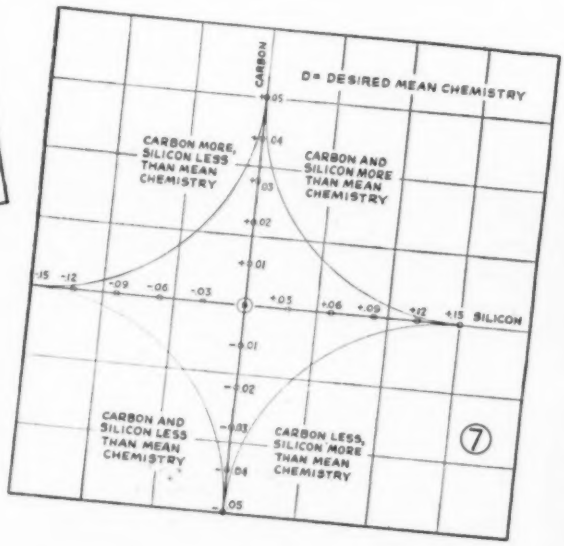

CARBON
D = DESIRED MEAN CHEMISTRY
CARBON MORE, SILICON LESS THAN MEAN CHEMISTRY
CARBON AND SILICON MORE THAN MEAN CHEMISTRY
CARBON AND SILICON LESS THAN MEAN CHEMISTRY
CARBON LESS, SILICON MORE THAN MEAN CHEMISTRY
SILICON
⑦

Fig. 5—Chart showing fuel and metal charges for different size cupolas. Fig. 6—Time study of the cupola, illustrating intermittent tapping technique. Three types of cupola performance are illustrated. Fig. 7—Chart plotting permissible deviations in carbon and silicon chemistry for fast annealing of ferrite malleable. Fig. 8—Molding line of malleable iron foundry. Fig. 9—Radiant tube annealing furnace, annealing about 15 tons of castings per 24-hour day

phur in fuel, amount of fuel used, amount of steel in the charge, surface area of the steel scrap and fluxing conditions in the cupola. Blackheart malleable production, for ferritic malleable, maintains a manganese-sulphur balance in that the manganese content of the air furnace product is two times the amount of sulphur plus 0.15 percent manganese. Thus, with an 0.10 percent sulphur malleable iron, 0.35 percent manganese would be desired. This is an important consideration in the malleable duplexing process because the manganese loss is somewhat higher than in batch melting in the air furnace and the sulphur increase is 2 to 4 times greater.

This second of two articles on duplexing in malleable iron production continues a discussion of chemistry of the cupola charge. Importance of the time element in tapping is emphasized, and the significance of different variables in cupola operation is described.

The sulphur content of the cupola product may be reduced from 30 to 50 percent by treating the metal with fused sodium carbonate before it enters the air furnace. This desulphurizing treatment may be made potent enough to reduce a sulphur in the cupola product in the range 0.10 to 0.20 percent to less than 0.10 percent in the air furnace product. Cupola-air furnace malleable duplexing systems usually provide for gravity flow of metal between cupola and air furnace, and desulphurizing is accomplished by designing the cupola spout to hold a reservoir of metal equivalent to 20 percent of the hourly melting capacity of the cupola. This spout receives and discharges metal continuously. Fused sodium carbonate is added to the metal at regular intervals. The spout has a dam arrangement to separate metal and slag.

Unit Should Be a Constant

Fig 5, cupola fuel and metal charges for duplexing malleable iron, refers to item 4 of the qualifying operating details, described in the previous installment, when carbon control with low amounts of carbon in the cupola product is to be achieved with reasonably high metal temperatures.

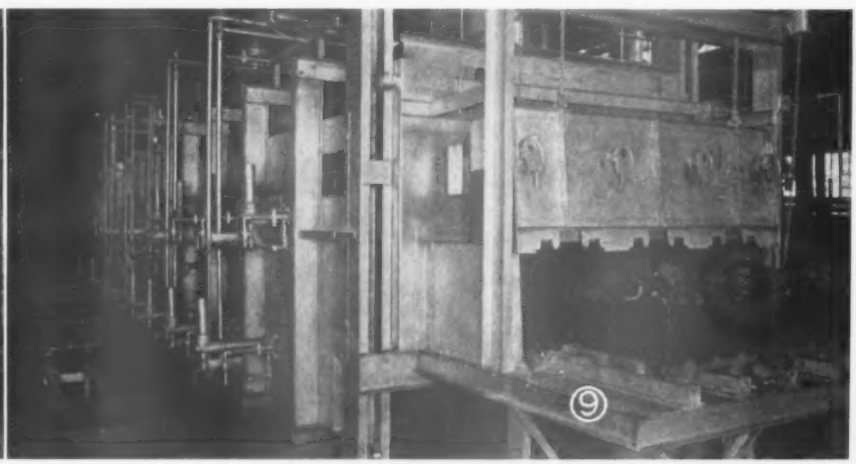
When the operation of a cupola is analyzed on the basis of thermal performance the fuel unit per square foot of cupola area should be a constant. This constant for high-quality performance may be as much as 10 pounds of coke per square foot of cupola area for intermediate coke charges, but it should not exceed this quantity and whenever a smaller amount, as 7.5 pounds, can be utilized it is desirable to do so. The minimum limit is not determined by the melting operation but by the facilities provided for weighing and moving materials between yard storage and position in the cupola.

Within the foundry industry of the United States this unit varies between 5 and 30 pounds. It will vary widely from one malleable foundry to another, and should any one malleable foundry be operating more than one size cupola, it too will be inconsistent in this fuel unit.

An extremely important element in good cupola operation, and referred to in item 8 of the qualifying details, is TIME. A time study of the cupola may be made either at the charging door of the cupola or at the tap spout. Fig. 6 illustrates an intermittent tapping technique. Three types of cupola performance are illustrated.

Shows Cupola Performance

The middle curve shows performance of a cupola when the coke bed height is selected properly. In the first 8 minutes after the air supply reaches the tuyere zone of the cupola, a condition of equilibrium is established and metal should be accumulating in the well zone any time after the first 8 minutes. The numbers along this curve, i. e., 1, 2, 3, 4, 5, etc., are the taps of metal and it should be noted that the time element between each tap is uniform and that the time interval from one tap to another is brief. The time interval, as illustrated, is one tap every 4 minutes or 15 taps per hour. This is the slowest tapping frequency that should prevail when optimum carbon control in the cupola product is desired. When lower and lower carbons are desired the tapping frequency should increase to a frequency of one tap every 90 seconds or 40 taps per hour. When the time interval between one tap and the next is as little as 90 seconds or as much as 240 seconds the tap hole will be botted up for a portion of the time and the metal stream will be flowing through the tap hole for the balance of the time. When intermittent tapping is resorted to on the production of low carbon irons the tap hole size should be as large as is practical and the time metal (*Please turn to page* 173)



This paper was presented at Cleveland, Nov. 30, before a special technical meeting sponsored by the Magnesium Sand Castings Branch of the Aluminum-Magnesium Division, WPB, for representatives of magnesium foundries. It discusses melting equipment, and modern practice in melting, fluxing and pouring magnesium in sand.

Melting and Pouring Magnesium

By M. E. BROOKS
Dow Chemical Co.
Bay City, Mich.

MAGNESIUM alloys are melted and poured from crucibles which are welded from ordinary boiler plate. The casting crucibles used in this country vary in size from about 60 to approximately 1000 pounds metal capacity. To minimize the analytical and physical control necessary for aircraft castings, it is the practice to melt the metal in large crucibles holding from 1200 to 2000 pounds and pour this metal at a temperature of 1320 to 1400 degrees Fahr. into the casting crucibles for cleaning and superheating. These large crucibles are of two types—those welded up from boiler plate and those made of cast steel. These crucibles are fired with either gas or oil. Under normal conditions of operation, the products of combustion of the melting furnaces have no effect upon the quality of the metal.

Since unprotected boiler plate scales badly under conditions of use, it has been found desirable, both from a safety and economical standpoint, to protect the crucibles by treatment with aluminum. This is accomplished by spraying molten aluminum on a properly prepared steel surface and this is followed by heat treatment to give penetration of the aluminum into the outside 10 to 15 thousandths of an inch of the steel plate. When properly applied, this treatment decreases the scaling to such an extent that usually crucibles are discarded because of distortion due to load at high temperatures rather than because of scaling.

Control of the combustion products in the furnace, so as to minimize the amount of oxygen present and to maintain a reducing atmosphere by keeping 2 or 3 per cent of CO present, has been found to decrease scaling greatly and prolong the life of the crucible on large melting units.

Must Check Crucible Soundness

Some regular and thorough method of checking the soundness of the crucibles should be carried on at all times. This is particularly true of the large premelting crucibles which should be checked by calipering at certain intervals. Crucibles should be discarded when spots are found which have scaled down to some predetermined figure. Provision also should be made in the installation of these large premelting furnaces so that if the crucible should leak in service, the molten metal will not flow out onto the floor and cause trouble but will be carried into some sort of an emergency container in which the burning of the magnesium alloy can be controlled.

In both the large premelting furnaces and in the smaller furnaces for heating the small casting crucibles, care should be taken that no appreciable amount of iron scale is allowed to build up. If iron scale accumulates in these furnaces and the crucible leaks molten magnesium alloy into this hot iron scale, a thermit reaction may result in serious consequences. This can be avoided by the simple process of keeping the furnaces clean and free from scale.

If the metal is melted in a premelt crucible, a thin flux should be used in such quantities as required to prevent burning. Care must be taken to prevent the accumulation of large quantities of this flux or of sludge in the bottom of the crucible, as this will decrease the life of the crucible due to excessive scaling on the outside. The temperature of the metal in the premelt crucible should be kept at 1320 to 1350 degrees Fahr. The normal ratio of ingot to scrap is about 1 part of ingot to 4 parts of scrap, although 100 per cent scrap can be used without deleterious effect upon the quality or properties of the casting.

All ordinary clean foundry scrap may be melted directly in the premelt furnace and transferred to the casting crucibles for pouring castings. This type of scrap is from gates, risers, runners, scrap castings, etc. Floor sloppage, pouring basin skins, dirty sprues, and metal of that type, should be melted down and cleaned in a crucible and cast into ingot. This purified metal then may be charged into the premelting furnace in the same way as the clean scrap.

Silicon is the only impurity which is likely to be picked up in ordinary foundry operations. If castings are charged into a melting furnace with cores only partly knocked out or with sandblast or foundry sand on the casting, the SiO_2 will be reduced (*Please turn to page* 193)

Canadian Foundry makes variety of castings

By PAT DWYER
Engineering Editor
THE FOUNDRY

A FEW years ago when construction and traffic on the famous Burma road were tangled to an apparently hopeless degree, a United States trucking tycoon from the Pacific coast was handed the highly complicated problem with the request to untie some of the knots, straighten out the kinks and keep the big trucks rolling. The interesting story presented in a national magazine commented on the fact that the man had early training as a New York taxi driver, an occupation in which traffic jams, congestion and hair-breadth exploit are not entirely unknown.

Looking around for a larger field where he could exercise his talents and capitalize on his thorough and intensive training, he organized a trucking company on the West coast, solicited business from every possible source and became an active and aggressive competitor of the railroads. Told on one occasion that he was sticking his neck out too far, that he could not possibly handle certain bulky and heavy objects, he boldly declared

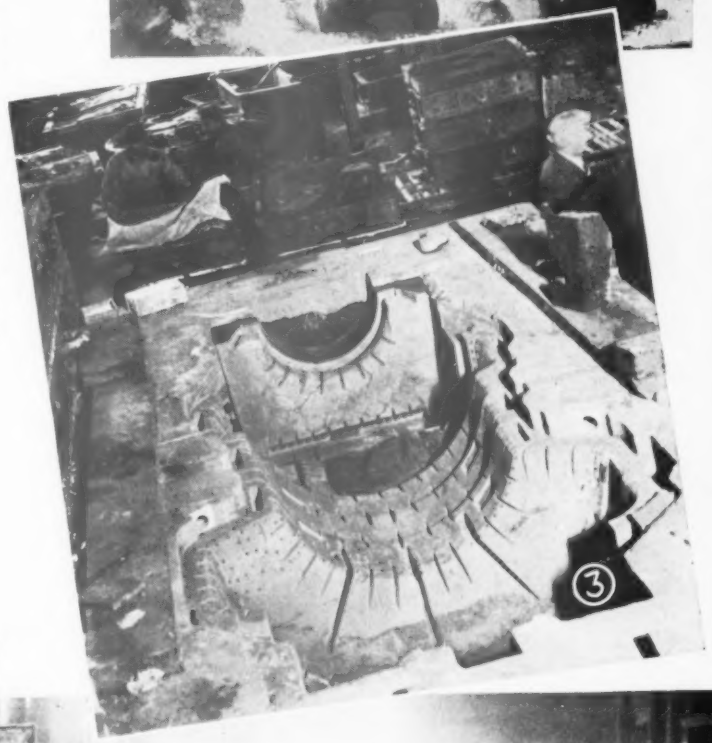
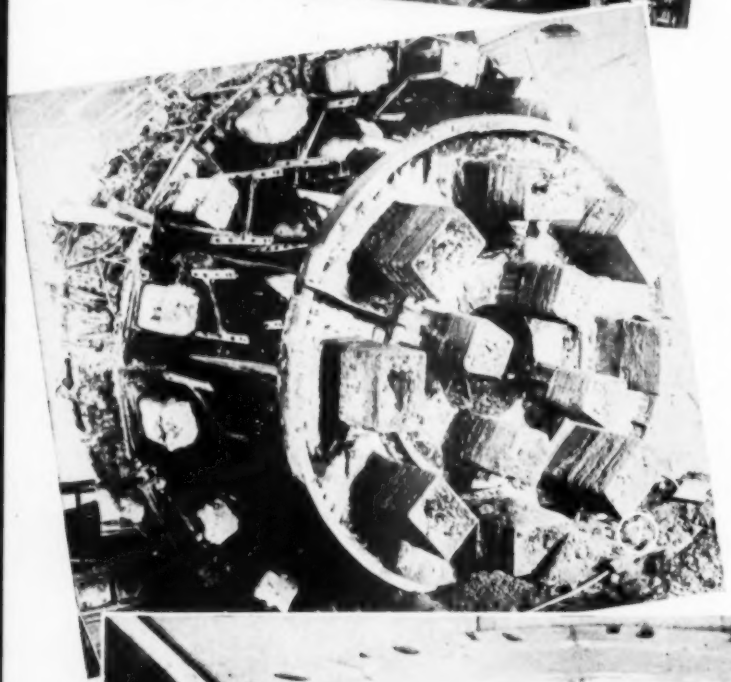


Fig. 1—An elaborate set of risers is required to insure dense solid metal in the twin barrel naval gun casting. Fig. 2—After the cores are placed in the drag, flour is sprinkled on the joint and the cope is tried on and off to verify a uniform touch. Fig. 3—Drag mold of a high pressure turbine casing dried and ready for reception of cores

Fig. 4—Large turbine casing on the floor of the cleaning department and before the gates and the great number of large risers were removed. The gates, as may be noted in center foreground, are formed in tiles

Fig. 5—Drag mold with cores in place for a 2-pound gun side carriage. Sprue is shown at the extreme left. Fig 6—Casting made in the mold shown in Fig. 5, illustrating position of gates and risers



he could move anything that had two loose ends.

The steel foundry unit of the Canadian Car & Foundry Co., Montreal, can lay claim to a somewhat similar distinction. Castings in an almost infinite variety of shapes and sizes and for almost every conceivable purpose keep the shop running day and night. Castings range in weight from a fraction of a pound to pieces that tax the lifting capacity of the cranes and the carrying capacity of the railroad cars. Castings shown in the accompanying illustrations indicate to some extent the variety and extent of the field that is covered. Other lines include high carbon and alloy steel rolls, manganese steel castings for the mining industry, manganese and built-up track work for steam and electric roads, locomotive and marine castings, and large and intricate castings used in connection with the hydroelectric development of Canada's water power.

Originally 200 x 600 feet, the steel, brick and glass-walled foundry building has been enlarged on several occasions. A recent 125-foot addition to the north end brings the total length close to 1000 feet. Three rows of steel columns supporting the roof and crane runways divide the building into four longitudinal bays. Three open-hearth furnaces and one electric furnace with auxiliary equipment and supplies, occupy the greater part of the first bay. Large dry sand molds are made in the second bay. Coremaking equipment, including a number of ovens, occupy about half the space in the third bay. Remainder of the space in this bay is utilized as a molding and pouring floor for medium size molds made either in green or air dried sand. Miscellaneous small castings are made in green sand molds in the fourth bay. In the latest addition to the foundry, (*Please turn to page* 188)

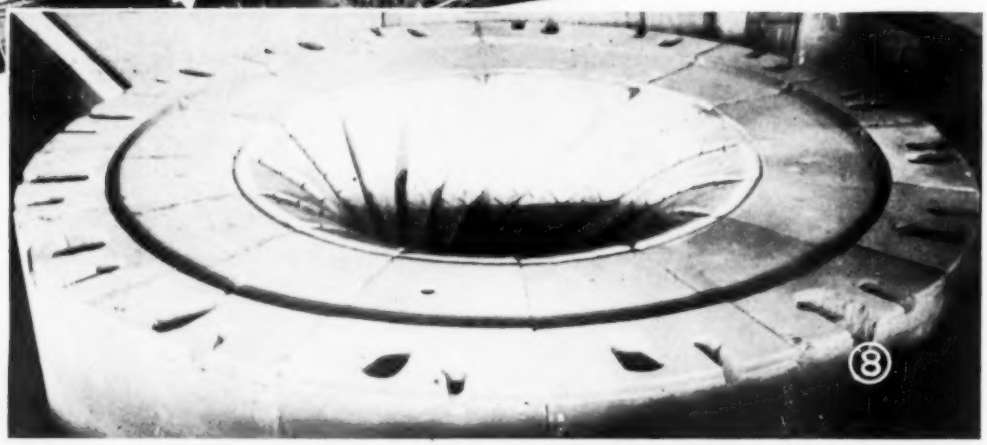


Fig. 7—This 50,000-horsepower hydraulic runner casting is fed by large risers on the top and by a second row of risers on the lower ring. Fig. 8—Mold for the runner is made up of a set of cores assembled in a pit

A COMPREHENSIVE schedule of papers and committee reports on newer developments in technical and shop practices is being developed by the program committee for the third Foundry War Production Congress of the American Foundrymen's Association, to be held in Buffalo. As previously announced, Tuesday, April 25 through Friday, April 28 are dates for this congress, which also marks the 48th Annual Convention of the A. F. A. An extensive foundry show will be held in conjunction with the congress, housed in the new Buffalo Memorial Auditorium.

In addition to numerous papers and committee reports the program committee also is planning a series of sessions of the panel type to present discussions on special war production problems of the foundry industry. While the list of the special sessions on war production problems is not complete, a tentative schedule of the sessions being sponsored by the A.F.A. Divisions and General Interest committees is outlined on page 149 of this issue.

Included in this schedule is a series of papers on newer developments in centrifugal casting methods. Featuring this series will be a paper by Peter Blackwood, Ford Motor Co. of Canada Ltd. Other papers in the series will be presented by members of the staffs of Ampco Metals Inc., Milwaukee, and the American Cast Iron Pipe Co., Birmingham. The Malleable division will feature a symposium on "Heading and Gating Malleable Castings," with men from some eight foundries discussing the theories and practices for various classes of malleable castings.

Of greatest interest to that growing group of foundrymen entering the field of magnesium and aluminum casting will be an extensive program sponsored by the division's program committee headed by Wayne Martin, Sperry Gyroscope Co., Brooklyn. In this program will be included the exchange paper of the Institute of British Foundrymen written by John Vickers, Rolls-Royce Ltd., England. The title of Mr. Vickers' paper will be "The Mechanized Production of Gravity Die Castings".

One of the most extensive programs being sponsored will be that of the Steel division with some 12 papers.

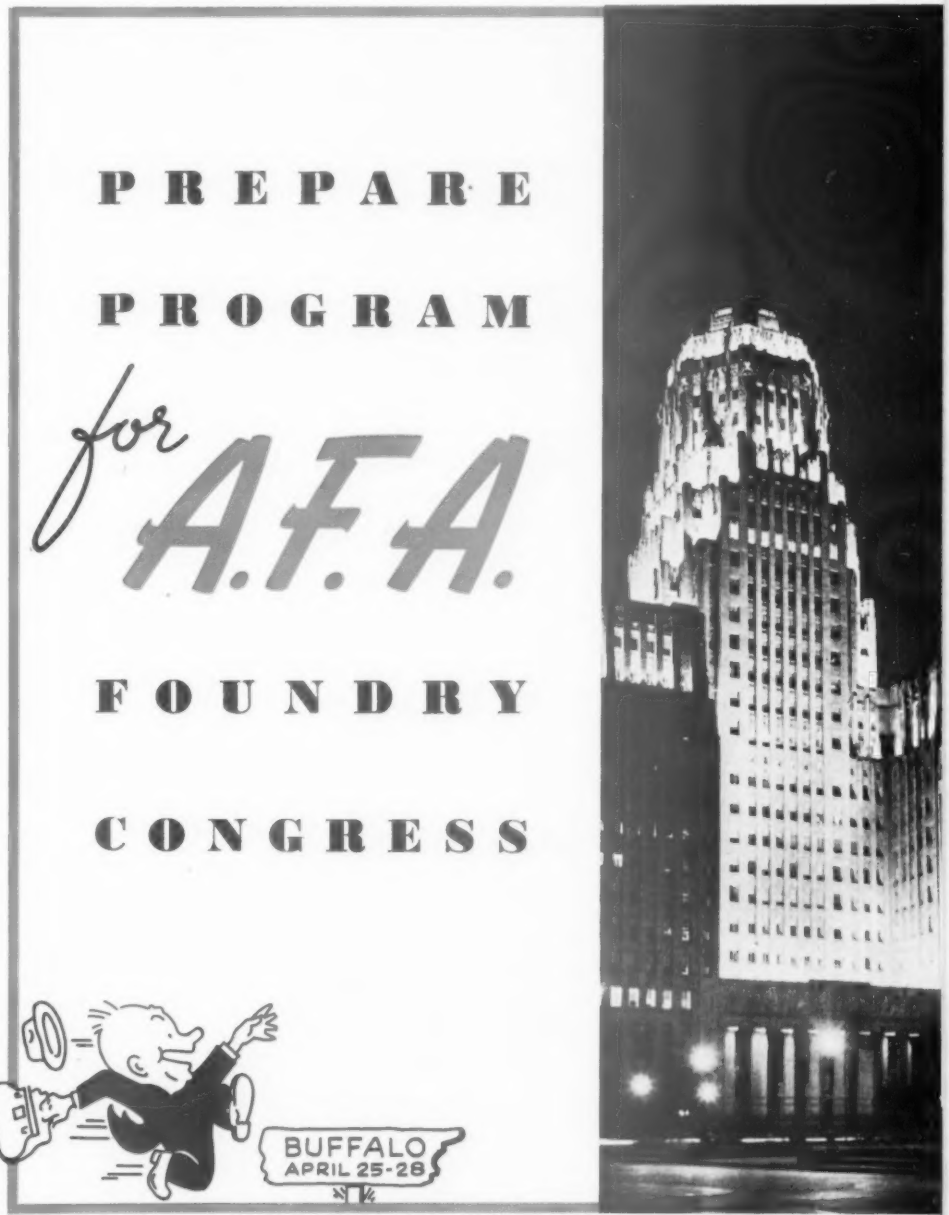
The annual Awards Lecture is to be given by Dr. H. W. Gillett, Battelle Memorial Institute, Columbus, O. Dr. Gillett's paper will cover "Cupola Raw Materials".

The complete program, details of which will be published later, includes more than 60 papers and reports. In addition, a number of round-table meetings will be held discussing current problems presented by various discussion leaders.

As currently planned, presentation of papers relating to aluminum and magnesium, brass and bronze, and malleable will be concentrated in the first three days of the congress, with steel, patternmaking, and gray iron discussions emphasized during the last three days. General subjects, such as cost, inspection, training, sand research, plant and plant equipment, safety and hygiene, refractories, and job evaluation, will receive attention throughout the week.

"Inspection of Castings" will be one of the new subjects included in the congress program. Two sessions on this subject will be sponsored by the recently formed Committee on Inspection of Castings, one a panel discussion of certain problems, the other a session at which informative papers will be presented. M. D. Johnson, Caterpillar Tractor Co., Peoria, Ill., is chairman of this committee.

A four-session lecture course (*Please turn to page* 149)



Tests Graphite Rods in producing cast steel

By FRANK J. VOSBURGH
and
HOWARD L. LARSON
National Carbon Co.
New York

AS INDICATED in the previous discussion in the January issue, it was evident from the various tests on the use of graphite rods in semiblind risers and the results obtained, that some of the factors had interlocking effects. Lebanon Steel Foundry had established to its satisfaction that a 4-inch diameter by 5-inch high riser was satisfactory for a ⅜-inch carbon rod, since with that combination the tail of the shrink was safely away from the runner. Tests indicated that when using a ⅜-inch graphite rod the height of riser could be reduced up to ½-inch insofar as the shrink cavity was concerned, but that metal containing higher carbon content than desired, might enter the runner and even the casting.

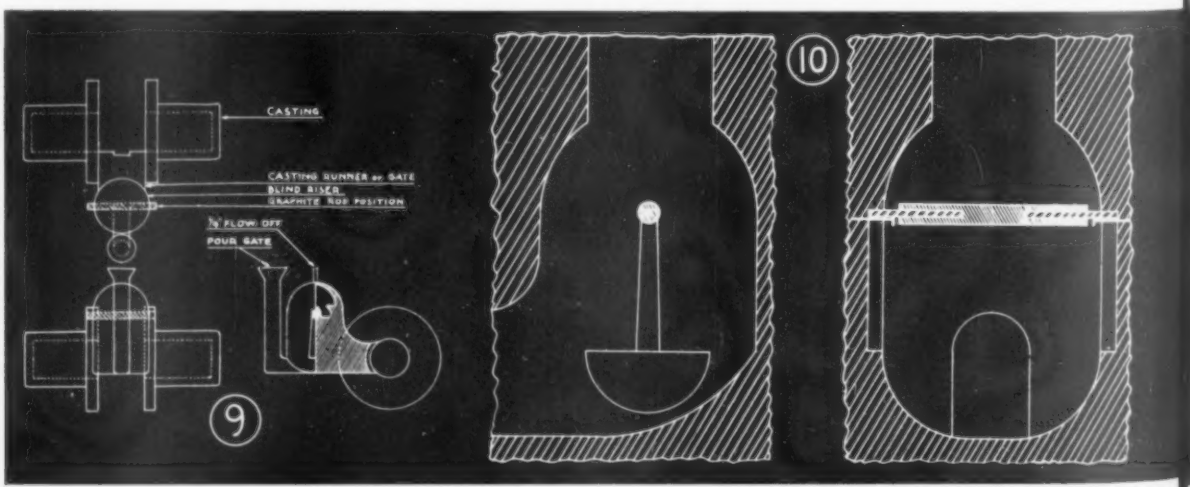
Balancing the two situations, it was decided to use a ¼-inch graphite rod for the 4-inch riser with its slightly longer shrink cavity but with its smaller travel of the increased carbon. Using a ⅜-inch graphite rod, 1¾ pounds of poured metal could be saved by shortening the riser ½-inch, but by using a ¼-inch graphite rod the riser could be shortened 1 inch, saving 3½ pounds of poured metal. Complete data is not available to make it possible to compare core sand rods with graphite rods, but drawing conclusions from Fig. 11 (referred to later) it seems probable that the saving in poured metal might run up to 7 pounds under the circumstances.

An interesting though unanticipated result of the tests was ascertaining that, with the increase in temperature of the riser metal as a result of the heat of combustion of the carbon, and the increase in fluidity of the metal because of the increase in carbon content, the runner section could be reduced, giving a further increase in the pounds of metal not needed and consequent reductions in cutting and grinding costs. This saving in metal and labor may be the most important of all.

Other methods of using core sand vents in risers were being used in other foundries and some investigation was made of results obtained. Fig. 11 compares the results obtained using a sand core rod or a button in the top of the riser which also had two ¼-inch diameter vents in the riser top, and the result when a ⅜-inch square graphite rod was used under the same conditions. However, it can be seen that travel of carbon pickup from the rod is almost equal to length of shrink. This, in combination with the fact that much of the rod can be seen remaining in the riser, obviously indicates the desirability of a smaller rod (¼-inch diameter) instead of ⅜-inch square. It should be noted that in the latter test all of the graphite rod was not consumed, possibly because the ¼-inch diameter vents in the riser did not supply sufficient air quickly enough to support combustion until the rod ends burned out in the sidewalls. Fig. 9 shows the method followed.

Other methods were investigated in other plants; for example, a button of carbon material placed in the upper

Fig. 9—Views of second testing arrangement. Blind riser 3½ inches in diameter with graphite rod ⅜-inch square and 4½ inches long. Fig. 10—Methods of suspending graphite rod in semi-open riser by tungsten pins to eliminate factor of rod permeability



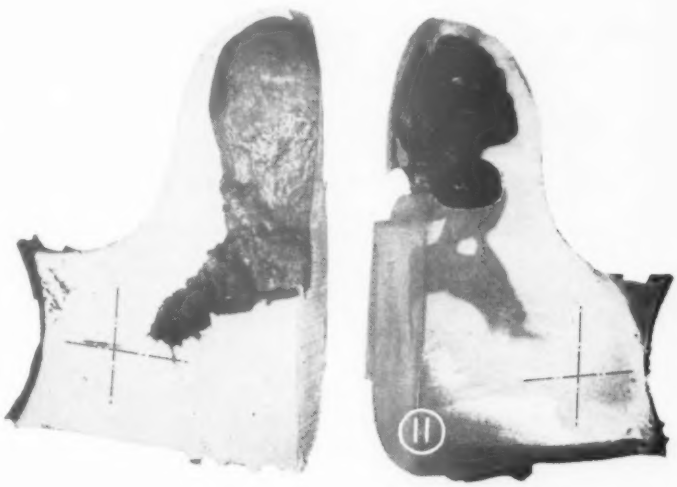
part of the riser. That method can be criticized on one score at least, that the button does not remain in contact with the hot metal long enough to affect either temperature or carbon content to practical advantage.

Effect on metal temperature can be calculated with some degree of accuracy by making assumptions. All the graphite may be burned to give heat to the metal as one extreme, or all may be absorbed by the metal to increase the carbon content. Either way the metal is more fluid.

Taking as an example a particular 4-inch diameter riser 5 inches high, the amount of metal above the centerline (parting line) of the casting runner weighs 15.4 pounds. The graphite rod ⅜ x ⅜ x 5 inches weighs 0.0396-pound. The heat of formation of ferric carbide is minus 2260 B.t.u. per pound of carbon or minus 91.4 B.t.u. for the rod. The heat of formation of carbon dioxide is plus 14,150 B.t.u. per pound of carbon or plus 560 B.t.u. for the rod.

Therefore, if all the rod enters solution to form iron carbide, the temperature of the riser metal will drop 36 degrees Fahr. in addition to the natural cooling. If all the rod is burned to carbon dioxide, the temperature of the riser metal will be raised 225 degree Fahr. to offset the natural cooling. Admitting that neither extreme is probable, but that perhaps half the carbon is consumed. and half absorbed, then the temperature of the metal would be raised 95 degrees (*Please turn to page* 187)

This is the second of two articles describing the results obtained from use of graphite rods in semiblind risers in steel castings production. It discusses the relation of rod size to riser size, and the advantages of the method. The first article appeared in the January issue.



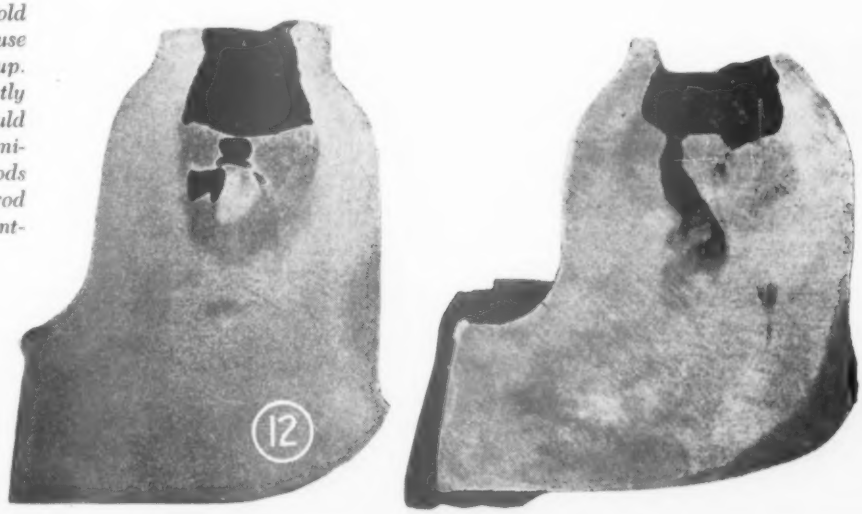
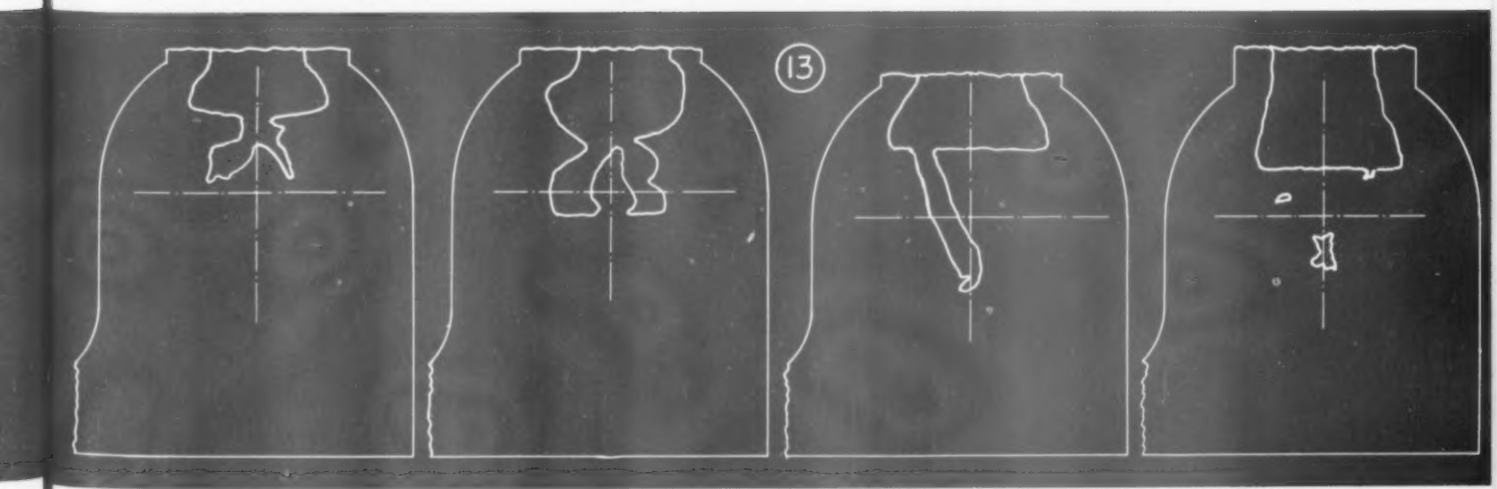


Fig. 11—At left is shown typical blind riser shrink (quarter section) with core sand vent rod or ram-up button placed in riser dome. Mold set-up as illustrated in Fig. 9. Right shows use of ⅜-inch square graphite rod in same set-up. Rod ¼-inch diameter would have given slightly deeper shrink but tail of carbon pickup would have been less. Fig. 12—Sections of semi-open risers with and without graphite rods suspended by tungsten pins to eliminate rod permeability. On the left is conventional mounting with rod across riser. On the right using tungsten pins supporting rod. Note different shrink shapes but almost identical tail length of carbon pick-up. Fig. 13—Sketches of 3½-inch diameter risers above centerline of casting runner illustrating shrinks with ¼-inch graphite rods mounted in conventional manner (two left sketches) and with tungsten pins (two right sketches). No great difference is indicated in depth of shrink



Cores for Hand Grenades Must Be Vented Sufficiently

Q.—Several years ago THE FOUNDRY presented an illustrated descriptive article on the production of hand grenade castings. If one is available we should like to have a copy of the issue containing that article. We are making hand grenade castings at present, but our loss is excessive through core blowing.

A.—Articles describing the production of hand grenade castings appeared in the February and April 1918 issues of THE FOUNDRY. Outside our bound volumes we have no back issues for that year. However, there is no need of going that far back. A complete and detailed description of how hand grenade castings are made under modern conditions, appeared in the December 1943 issue of THE FOUNDRY. In your present practice where core blows constitute your principal trouble, it is obvious that a proper change either in your core sand mixture, or your method of venting the cores—or perhaps a combination of both—is all that is necessary. Small cores practically surrounded by molten metal must have high permeability, low binder content and clear, open vents. It might be advisable in the present instance to check up on the method employed in closing the molds. The cores may be perfectly satisfactory in every respect, but they certainly will blow if a proper passage is not provided through the mold sand from the core print to the outside atmosphere. Instances have been known where this passage was provided in the pattern equipment and then rendered inoperative by a band or a tight fitting slip jacket.

Pinholes in Small Castings Caused by Clay in Sand

Q.—We are forwarding pieces from two small gray iron castings and will appreciate your opinion on the cause of many small pinholes. Analysis of the iron shows: Silicon 2.44 per cent, sulphur 0.009 per cent, phosphorus 0.23 per cent, manganese 0.62 per cent, graphitic carbon 2.81 per cent, combined carbon 0.64 per cent. The cupola charge consists of 50 per cent pig iron, 45 per cent return and purchased scrap and 5 per cent steel. The iron is made up in 1600-pound charges, melted in a 48-inch inside diameter cupola and tapped at an average temperature of 2800 degrees Fahr. The metal is tapped into 1000-pound bull ladles for distribution to the various floors. Total heat approximately 20 tons per day.

A.—A casual glance at the castings might lead one to the opinion that the iron is slightly oxidized. However, a closer and more careful examination cancels this opinion and convinces us that the composition of the iron and method of melting are not responsible for the pinholes. These defects are all located on the outside surface, that is the surface formed by the green sand mold. None appear on the inside surface formed by a dry sand core. Method of preparing the molding sand may be a contributory factor, but the main cause of the defects is too much clay in the sand. In the ordinary shop language the sand is too tight. Also the clay is not distributed in a sufficiently uniform manner. A certain amount is in the form of small balls or pellets. Back a short distance from the pattern, these pellets do no harm, but the pellets which come into immediate contact with the pattern are definitely harmful. Each pellet emits an almost microscopic jet of gas when in contact with the molten iron. These jets form the pinholes. How to remedy this condition depends on what sand testing, and sand preparation equipment is available. Consequently, it will be necessary for you to study your conditions and then develop proper corrective procedures to eliminate pinholes.

High Zinc Content of the Brass Is Cause of Difficulty

Q.—We operate a foundry in Uruguay, and are having trouble with gray iron molds into which we cast brass. After the molds are used 8 or 10 times they become covered with a white film which causes the castings to be pinholed or to have a dirty surface. The molds are made of 60 per cent high silicon pig and 40 per cent good steel scrap with a resulting analysis of 3 per cent silicon, 0.60 per cent manganese, and 0.15 per cent phosphorus. The brass contains 62 per cent copper, 34 per cent zinc, 3 per cent lead, and 1 per cent aluminum. We also are having trouble in that our crucibles give only 50 heats with coke as compared to 100 to 120 heats obtained with oil firing.

A.—Your difficulty in making permanent mold castings is not due to the mold or its composition, but to the type of brass being used. High zinc brasses lose considerable zinc, due to volatilization in the form of a white smoke. However, that loss is suppressed to a great degree by addition of aluminum, and 1 per cent should be more than enough to operate effectively. Consequently, it appears to us that you are pouring at too high a temperature, or pouring so that the aluminum oxide skin or envelope is broken. Therefore, we suggest that you decrease your melting and pouring temperature to a point where zinc

oxide fumes or smoke are not evolved except when the surface skin on the crucible is broken with a skimmer. Also pour carefuly so that the oxide envelope surrounding the stream remains intact.

While the life expectancy for a crucible used in an oil-fired furnace is considerably greater than for one used in a coke-fired, pit furnace, it appears that there is too large a range in your case. Possibly a poor grade of coke may fuse to the crucible more than with a good grade, and consequently pieces of the crucible may be knocked off in trying to clean off the outside. Also it may be that the furnace operator in punching down the coke may tend to gouge the crucible or drive the coke down too tightly. Presumably you have checked the crucible tongs to see that they fit without squeezing the crucible walls. A minimum distance of 3 inches should be allowed around the crucible and from 6 to 10 inches below the crucible for coke. Do not allow the crucible and charge to soak in the furnace after they have reached pouring temperature.

Diesel Liner Castings Develop Spongy Areas After Boring

Q.—We are making several sizes of diesel engine liners, and from time to time run into difficulty with small spongy areas appearing from time to time after machining or rough boring. The trouble is encountered only with one of the liners which is gated from the top. The others gated through the bottom give no indication of the spongy areas. The liners are made two in a mold, and have an internal diameter of 8½ inches which is rough bored to 9 inches and then honed. Casting is 23½ inches long with about 1-inch for cutting off in machining. The defect appears about 2 inches from the top after turning. Gating is through an umbrella core containing eighteen ⅜-inch diameter pencil gates. Can the liners be cast centrifugally?

A.—Examination of the section of the liner shows quite clearly the defect you describe, and to the naked eye it has the sooty appearance which often is associated with spongy areas. However, under a low power magnifying glass the cause is quite readily discernible as the areas show voids criss-crossed with feathery, pine tree crystals or dendrites. Further examination of the fracture on the opposite side and near the center shows evidences of the same condition. Therefore, we conclude that the defect is due to lack of feed.

You mention that it appears about 2 inches down from the top when it occurs, and that you only allow about 1-inch for a feeding head. Consequently, if you would extend the length of the pattern say 3 or 4 inches, the shrinkage would take place where it would not affect the finished casting. Undoubtedly, those shrinkage areas are in all the castings, but only are noticed when cooling conditions are such that the shrink moves from the center of the wall toward the face to be machined. More than likely if the machining allowance was reduced to ⅛-inch instead of the present ¼-inch, a nice smooth surface would be obtained every time.

As far as centrifugal casting is concerned, production of the liners should be ideal for such equipment. However, you must make a large enough quantity of liners to amortize the cost of the machines. It appears to us that a logical procedure would be to have a machine designed big and heavy enough to make the largest size liner. Then it could be used for making all three sizes of liners you mention. Perhaps a variable speed motor, or some other speed change device would be required since speed of rotation for large diameters is less than for smaller diameters —although it may be possible to use only one speed for all sizes.

Should Give Close Attention To Insure Feeding

Q.—We have made some silicon bronze castings and notice in some that small circles about ¼-inch in diameter appear zinc colored, and in the centers are small holes. The castings are made from ingot metal and poured at 2200 degrees Fahr.

A.—Without having any castings for examination, it is difficult to state definitely what causes the spots and holes, but our guess is interdendritic or intercrystalline shrinkage resulting from insufficient feeding although melting conditions may be responsible. Shrinkage of silicon bronze is about halfway between gun metal and manganese bronze, and the alloy has a narrow freezing range. Therefore large risers should be used, and the connection between riser and casting should be big enough to prevent freezing off.

Melting of silicon bronze is not difficult if attention is given to see that the furnace atmosphere is neutral or slightly oxidizing. Under no condition should it be reducing. Do not use charcoal as a cover—broken glass free from lead forms a good cover to protect the metal from furnace gases. If your castings are small or of thin section the pouring temperature you mention is all right. However, medium and heavy castings are poured at 1900 to 2000 degrees Fahr

GANGWAY!

By J. A. Patterson

'Sure, I asked you to bring me a washer—one of these little things."

Trouble Caused by Gassed Metal

Q.—We are having difficulty in making 80-10-10 bushings and billets without blow or gas holes showing up in the bore and exterior after machining. We use a good strong core and a well vented mold, and pour at about 1950 degrees Fahr. We have obtained the same results whether poured in the vertical or horizontal position.

A.—While the 80-10-10 alloy is one of the simplest to cast, it also is one of the easiest to gas during melting. Your description of the trouble indicates that it results from liberation of gases during solidification, and in all probability you are exposing the alloy to a long melting period, or the furnace atmosphere is high in reducing gases. It is suggested that you look over your furnaces and see that they are getting a sufficient supply of air. Also do not permit any of the ingot or scrap metal to extend above the tops of the crucibles during the melting period. If necessary add a crucible extender in the form of part of an old crucible.

It is possible that your cores may be too tight and do not vent properly, but since the holes appear both inside and outside, we do not believe that is the case. Your pouring temperature seems to be about right and your mention of a well vented mold suggests good molding practice. Pouring the castings vertically or horizontally would not influence particularly the condition resulting from gassed metal except that the highest part of the castings presumably would have the greatest number of holes since gases tend to pass upward, all other conditions being equal.

Plaster Molds for Matchplates

Q.—We have been making sand-cast matchplates for years, and now are interested in using the plaster molding process for such work. Can you give us any information on equipment needed, and the procedure to be followed?

A.—Matchplates may be produced by the plaster molding process with or without application of pressure, and the equipment, with the exception of an air compressor, will be about the same. It will include snap flasks and jackets or bands in several standard sizes; plaster; melting furnace and crucible; drying oven for molds in which the temperature can be raised to at least 600 degrees Fahr. Procedure in molding is to coat pattern with an oil-wax compound so that the plaster will not adhere to it, and place it in the proper size snap flask or frame. Pour in the liquid plaster which must be formulated according to directions supplied by the supplier. After the plaster air sets or hardens, which is around 20 minutes, the pattern is removed and the mold placed in the oven.

The mold is held at around 600 degrees Fahr. until it is thoroughly dry although lower or higher temperatures may be used. The higher the temperature, the more rapid the drying. After drying the mold is removed from the oven and allowed to cool down until it can be handled. Molds must not be permitted to become cold before pouring since they will absorb moisture. Generally to obtain increased pouring head on the molds, a long plaster sleeve is located over the sprue. It is of such size that it will hold all the metal required for the plate or casting. An asbestos disk is located at the bottom to prevent the metal running through until the sleeve is filled. With the pressure method, a cap attached to an air line is placed over the top of the sleeve, and the valve opened quickly. The additional pressure supplied by the air causes the asbestos disk to break and permit the metal to flow into the mold. If air pressure is not used, the disk is broken by puncturing the disk with a rod thrust down the sleeve.

Desires To Salvage Battery Plates

Q.—Can you give us any information on the procedure for melting battery plates? How is antimony separated from the lead? What apparatus is needed?

A.—Salvage of battery plates is outside of our field, and we only can give the general and not specific details of the procedure. Generally the plates are melted in a reverberatory furnace with the addition of 3 to 5 per cent coke or coal fines. After melting down, the charge is rabbled well to insure good separation of lead from the drosses which are skimmed from the furnace with a perforated ladle, allowing the molten lead to drop back into the bath. The dross can be sold to a secondary smelter or held for reworking in the furnace with suitable fluxes.

Some of the antimony will be removed in melting by oxidation, and more is removed after the dross is skimmed from the surface by definitely providing an oxidizing atmosphere within the furnace. That is accomplished by opening the side doors of the furnace to permit air to enter, and by blowing a blast of air over the surface of the molten bath. That procedure will reduce the antimony to 0.25 to 0.30 per cent. The antimony slag is skimmed from the furnace, and if further reduction of antimony is desired the lead is treated in large iron pots with 1 per cent zinc. Temperature should be about 1000 degrees Fahr. and the zinc stirred in well. After stirring the temperature is reduced to 750 to 800 degrees, and the metal allowed to set quietly for 30 minutes. Then the zinc crust is removed with perforated ladles, and the temperature raised to 805 degrees. Remaining zinc is removed by steaming.

THE FOUNDRY Index Ready

The index to Volume 71 *of* THE FOUNDRY, *covering* 1943, *is ready for distribution. Copies may be obtained by subscribers on request.*

Bar Fracture Shows Discolorations

Q.—We are enclosing a section of a fractured test bar of the 85-5-5-5 alloy which shows considerable discoloration over the fracture. Castings made from the heat reveal leakage. Alloy is purchased in ingot form and melted in silicon carbide or graphite crucibles in oil-fired furnaces. Trouble is not confined to one lot of ingots. Average melting with a cold pot is 35 minutes, and deoxidation is with phosphor-copper. We thought the trouble might be due to gas, but copper oxide addition had no effect. Some of the metal was melted, allowed to cool in the furnace, and then remelted, but that did not help. Pouring temperatures range from 1950 to 2160 degrees Fahr. with poor results throughout. Glass cover added with the cold metal is used. The particular bar was poured at 2140 degrees.

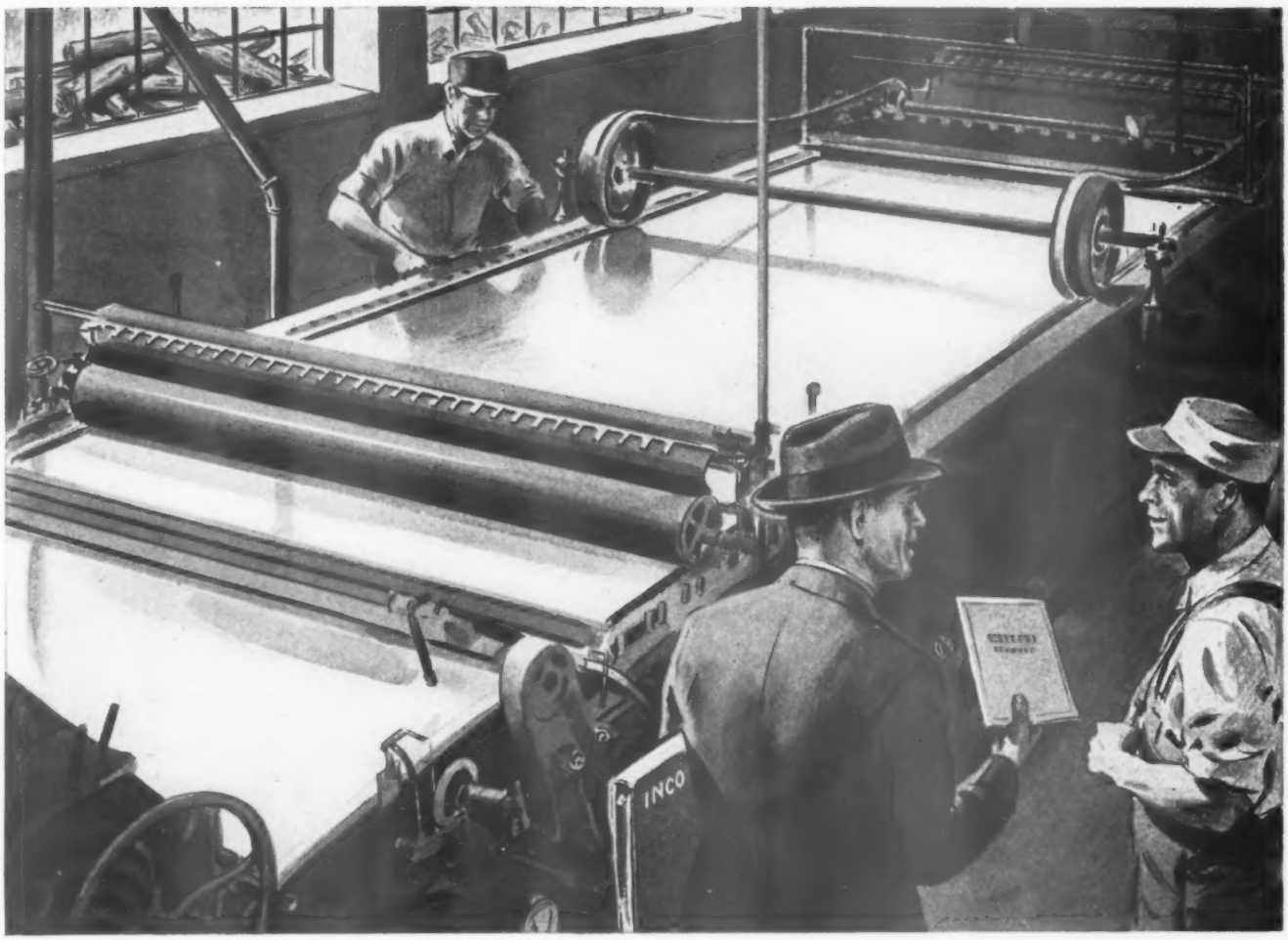
A.—Since many factors influence conditions it is difficult to give a definite answer on fracture appearance. From what you state, your practice seems to be excellent and while you do not mention how much metal you melt in 35 minutes, we assume that it is a reasonable amount, and that the metal should not absorb much gas. However, the fracture definitely indicates presence of gases, and possibly the lack of feed. Therefore, the condition may be a combination of the two wherein in some cases the preponderance of the trouble is due to gas, and in others due to lack of feed.

Addition of copper oxide, or of cooling the metal and remelting does not always correct the trouble, due to absorbed gases, since other factors such as furnace atmosphere, slags, etc., must be considered. We do not believe that you need use a glass cover since our experience has been that while the cover may serve to some extent as a protection against reducing gases, the glass tends to decrease transfer of heat. Hence, the metal must remain longer in the furnace. Also some covers tend to absorb gas, and give them off to the molten metal under certain temperature conditions.

Possibly in melting down the ingots, some of them are allowed to extend above the pot into the furnace atmosphere. As those become red hot they will absorb gases which will be carried into the molten bath. Therefore, it is advisable to charge the crucible so that the metal will be well below the lip, or else use a section of an old pot to extend the height so that the metal is protected against gases in the furnace atmosphere.

See that the castings as well as the

(*Continued on page* 134)



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(*Concluded from page* 132)

test bars are gated and risered properly so that an ample feed is available. Use of copper oxide is helpful at times, but best results are obtained by correcting the cause of gassed metal. Phosphor-copper in addition to deoxidizing tends to increase the fluidity of 85-5-5-5, and through that the soundness. The temperature at which you pour seems to be about right.

Mold Many Patterns On Matchplate

Q.—We have two 8-ton capacity overhead traveling cranes running through the center of our foundry from end to end and we should like to use them to advantage in the production of our cooking ware castings. If it is practical we would like to make matchplate patterns, about 20 of a kind on a board and the necessary equipment for making 20 at a time, using the cranes for handling the necessarily large flasks. We have in mind laying a track through the center of the building from end to end, passing the cupolas and tumbler room, mounting the bottom boards on wheels to fit the track and dumping the castings in from the tumbler room. If this can be done successfully, molding, pouring, dumping and cleaning could be done continuously all day and thus eliminate the necessity for a large amount of floor space, and no doubt decrease manufacturing cost. We also shall appreciate information on the best method of cleaning the castings.

A.—First introduced approximately 40 years ago, the method of molding and pouring on a conveyor in part or in whole, has been adopted by a great many foundries. All the large production foundries operaate on this principle. The method is quite feasible in the present instance, with a single exception. The proposed large flasks containing up to 20 individual castings will not work satisfactorily. Cast iron cooking ware, pots, kettles, spiders, etc., are thin in section. Molten iron loses temperature and consequent fluidity rapidly when poured into a sand mold. Therefore, each casting must be poured individually and directly from a small ladle. A single sprue in the center of the cope, with connected runner and gates at the joint of the mold, would deliver metal to a few mold cavities in the vicinity, but the metal would not run far enough to fill the distant cavities.

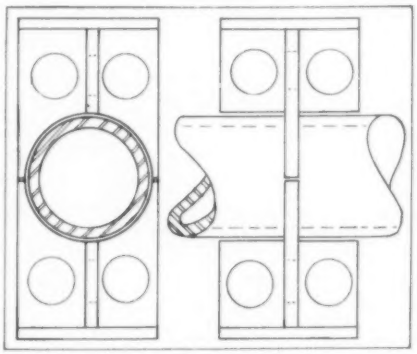
A large number of individual sprues, one to each casting, or in some instance, a pair of castings, would not solve the problem. First, there is the constant hazard of metal splashing into adjacent sprues. Second, all practical molders are familiar with the fact that when one casting is poured in a mold containing two or more, gas generated by the metal in the first mold seeps into the adjoining mold cavity or cavities. Combined with the air this forms an explosive mixture. When metal is poured into the second mold, an explosion takes place, mild or violent, depending on the size of the cavity, and the length of time the gas has been seeping into it. For certain types of large, bulky castings, the explosion might not do any damage, but in the majority of instances it would injure the molds for light castings.

Stud Chaplets Hold Pipes in Mold

Q.—We have three pairs of copper castings to make for electrode holders on an electric furnace. Each casting is 4 inches thick, 14 inches wide and 12 feet in length. Two lengths of extra heavy 1½-inch steel pipe, joined at one end and projecting from opposite sides near the other end, are to be enclosed in each casting. Would you advise running water through these pipes while the mold is filling with metal, or should the pipes be filled with some refractory material?

A.—Foundrymen occasionally run water, or in some instances a jet of air through pipes that are enclosed in molten metal, especially where the pipes are thin and the metal section is extra thick. However, in the majority of instances, also in the present instance it is not necessary. The thick steel pipe will serve as an interior chill and form a coating of solid copper to prevent the pipe from collapsing, or for any liquid metal to seep through the wall. The entire casting will have solidified before the pipe is raised to a temperature that will make it soft. The principal feature in making castings of this kind is to anchor the pipes in a manner that will prevent them from buckling or twisting.

During the pouring process, the rising metal in the mold first comes into contact with the lower face of the pipe and



Stud type chaplets hold the pipe

causes it to expand while the remainder of the pipe is still cold. The action continues until the pipe is completely submerged. Chaplets must be arranged to permit the pipe to expand in a straight line horizontally, but not up or down or sideways. A suitable type of chaplet for this purpose is shown in the accompanying illustration. The flat bottom rests on a brick or piece of plate in the face of the drag, while the top is in contact with a suitable bearing in the cope face. These chaplets are set about 2 feet apart. The pattern and small copper castings easily are made. Ordinary stem chaplets with sharp points driven into a bottom board, and upper ends secured by bars and wedges above the cope are not suitable.

The twisting pipes either will move from underneath them, or will carry the chaplets with them and loose the sand around the stem where it enters the cope face. In some instances where tubes are thin, it is customary to fill them with a mixture of clean silica sand and sawdust; 90 per cent sand and 10 per cent saw dust. The saw dust burns out and the sand then runs readily out of the casting. Pipes or any inserts in a casting should be perfectly clean and dry. If and when you decide to flow water through the pipes, be sure to have the water flowing through, before any metal enters the mold. Otherwise the first water will be converted to steam and a back pressure will be built up sufficient to break the hose connection and scatter steam and boiling water from the inlet end of the pipe.

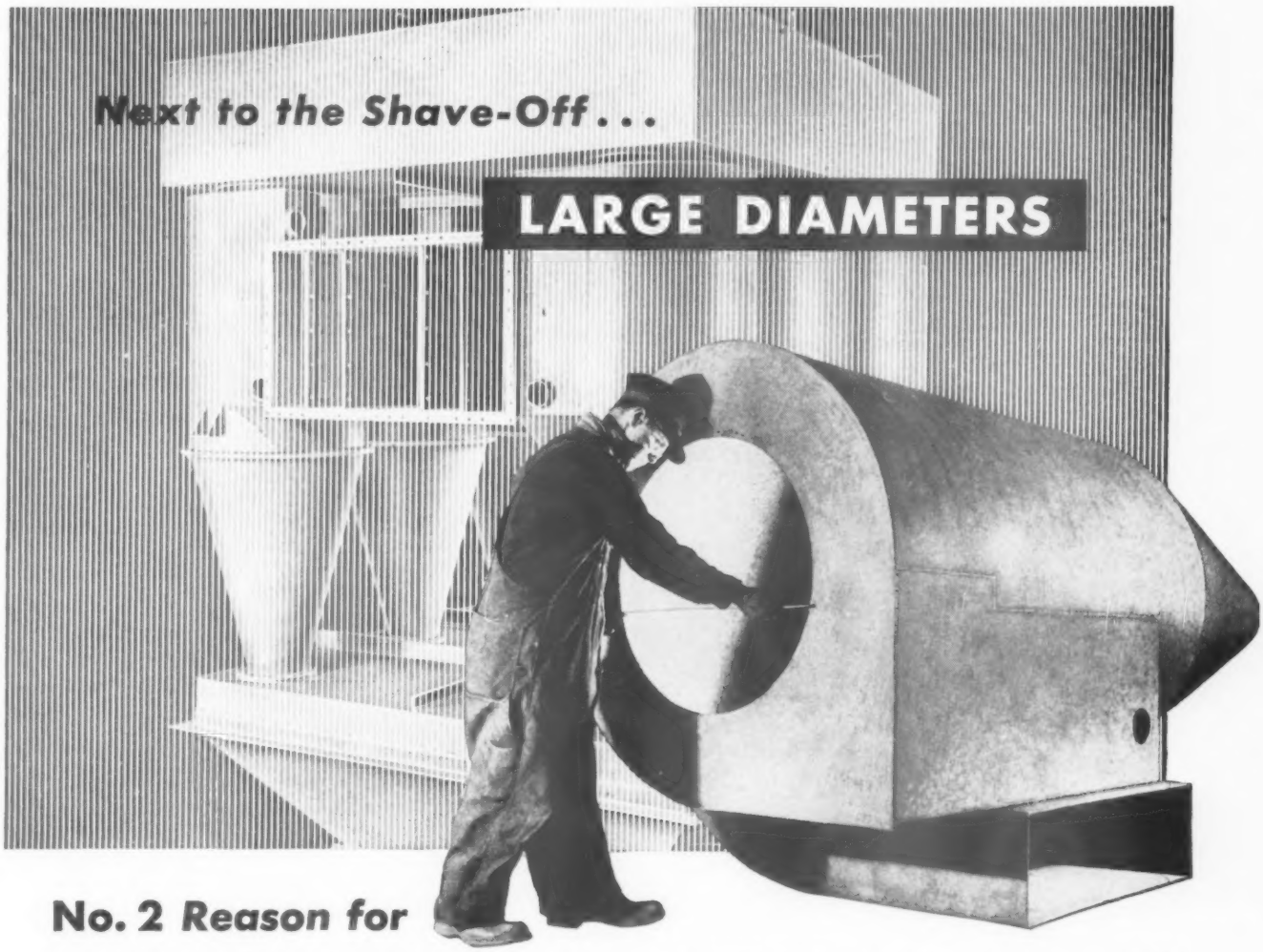
Makes Small Chill Cast Bushings

Q.—We have an inquiry to make some small bushings marked AMS-4845, bronze chill castings. They are 1-inch long, ⅝-inch inside diameter and ⅞-inch outside diameter. While we have made large chill-cast worm wheels, these small ones are something else, and we would like information on how to make them on a production basis. Also where can we obtain data on AMS specifications?

A.—The abbreviation AMS stands for Aeronautical Material Specifications which were developed by a committee of the American Society of Automotive Engineers, 29 West Thirty-ninth street, New York. The particular specification AMS-4845 is for the 88 per cent copper, 10 per cent tin, and 2 per cent zinc alloy more commonly known as gun metal or admiralty bronze. While it may be possible to make the small bushings in a chill mold if the walls are thickened sufficiently, we believe that the procedure would be wasteful of metal since more metal would be in the runners and gates than in the castings, not to mention the extra work in separating the castings from the gates.

It appears that the best way to make the bushings would be to cast them, say in lengths of 14 inches in the vertical position. That would permit cutting off 12 good bushings. As mentioned previously, the bushing would have to be cast thicker than in the final finished form, and just how thin-walled a bushing could be produced would have to be determined by experiment. Possibly you might get it to ⅛-inch, but more likely it will be around 3/16 to ¼-inch. The hole in the inside could be formed by a steel rod coated with silica flour by wetting the rod with core oil, then rolling in the flour, and baking.

Possibly producing the small bushing by the plaster molding process might be an answer to the problem, but we doubt if the structure obtained will be the same as obtained in a chill mold.



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MEN ... of Industry

JAMES H. LANSING has been appointed consulting engineer of the Malleable Founders' Society. In this capacity he succeeds the late Prof. Enrique Touceda who served the malleable iron industry for over 30 years. Following graduation from Williams College, active overseas service in the last war, and a course at the University of Toulouse, Mr. Lansing entered the malleable industry in 1919 at the Troy, N. Y., plant of the Eastern Malleable Iron Co. Shortly thereafter several months were spent in the study of metallurgy under Professor Touceda.

In 1924, Mr. Lansing became metallurgist with the Lakeside Malleable Castings Co., Racine, Wis., resigning later to become field assistant to the consulting engineer of the American Malleable Castings Association. Subsequently, for 7 years Mr. Lansing was general superintendent and works manager of the Danville Malleable Iron Co., Danville, Ill., and later general manager of the Grand Rapids Malleable Iron Works. In 1936 he assumed the duties of shop practice engineer of the Malleable Founders' Society and in 1940 took over additional duties as shop practice and development engineer. In his new capacity Mr. Lansing will retain his former responsibilities in addition to the new ones.

♦ ♦ ♦

Alfred W. Gregg, executive engineer of the equipment division, Whiting Corp., Harvey, Ill., has been appointed to supervise the new electric furnace department established last December when the Whiting organization acquired the Hydro-Arc Furnace Corp., La Grange, Ill. Mr. Gregg, who has been associated with Whiting Corp. for 12 years and is widely known in the foundry melting equipment field, will add the new responsibility to his present duties. He is a graduate of Purdue University. Moving of Hydro-Arc operations from La Grange to Harvey, originally scheduled for about Jan. 1, will be deferred for several months.

♦ ♦ ♦

A. Douglas Hannah has been appointed senior industrial specialist of the new Gray Iron Castings Section of the War Production Board, and **Edward C. Hoenicke** has been appointed consultant of the section. Formerly manager of the coal and coke truck loading division of the Pittsburgh Coke & Iron Co., Pittsburgh, and a director of the Barnett Foundry & Machine Co., Irvington, N. J., Mr. Hannah has served WPB for the past 2 years. He spent 3 months as industrial analyst with the Metals and Minerals Division and 20 months as assistant to the chief of the Steel Division's Pig Iron Section. A native of Pittsburgh, he is a mechanical engineering graduate of Princeton University.

Mr. Hoenicke recently had been assistant to the general manager of the Eaton Mfg. Co., Foundry Division, Detroit. He entered the foundry industry in 1916 with the Oliver Machinery Co., Grand Rapids, Mich. After serving with various companies in the Detroit district Mr. Hoenicke in 1928 left the Oakland Motor Car Co. to become sales engineer with the Holley Permanent Mold Machine Co. Inc., and when the Eaton-Erb Foundry Co. was organized in 1932 he was made sales manager. The Eaton-Erb company later became the Eaton Mfg. Co., Foundry Division.

♦ ♦ ♦

Harry L. McClees, formerly secretary of Crucible Steel Casting Co., Lansdowne, Pa., has been elected president, succeeding the late C. R. H. Cunningham. **Harry Bloodsworth Jr.,** formerly sales manager, has been elected secretary of the company.

♦ ♦ ♦

Thomas W. Curry has been appointed assistant metallurgist of the Lynchburg Foundry Co., Lynchburg, Va., succeeding **J. A. Havenen** who has entered military service. Graduated from Pennsylvania State College in 1932, Mr. Curry was foundry superintendent for 4 years at the Kennedy-Van Saun Mfg. & Engineering Corp., Danville, Pa. Subsequently he joined the York Corp., York, Pa., as assistant superintendent of the

(*Continued on page* 138)

JAMES H. LANSING

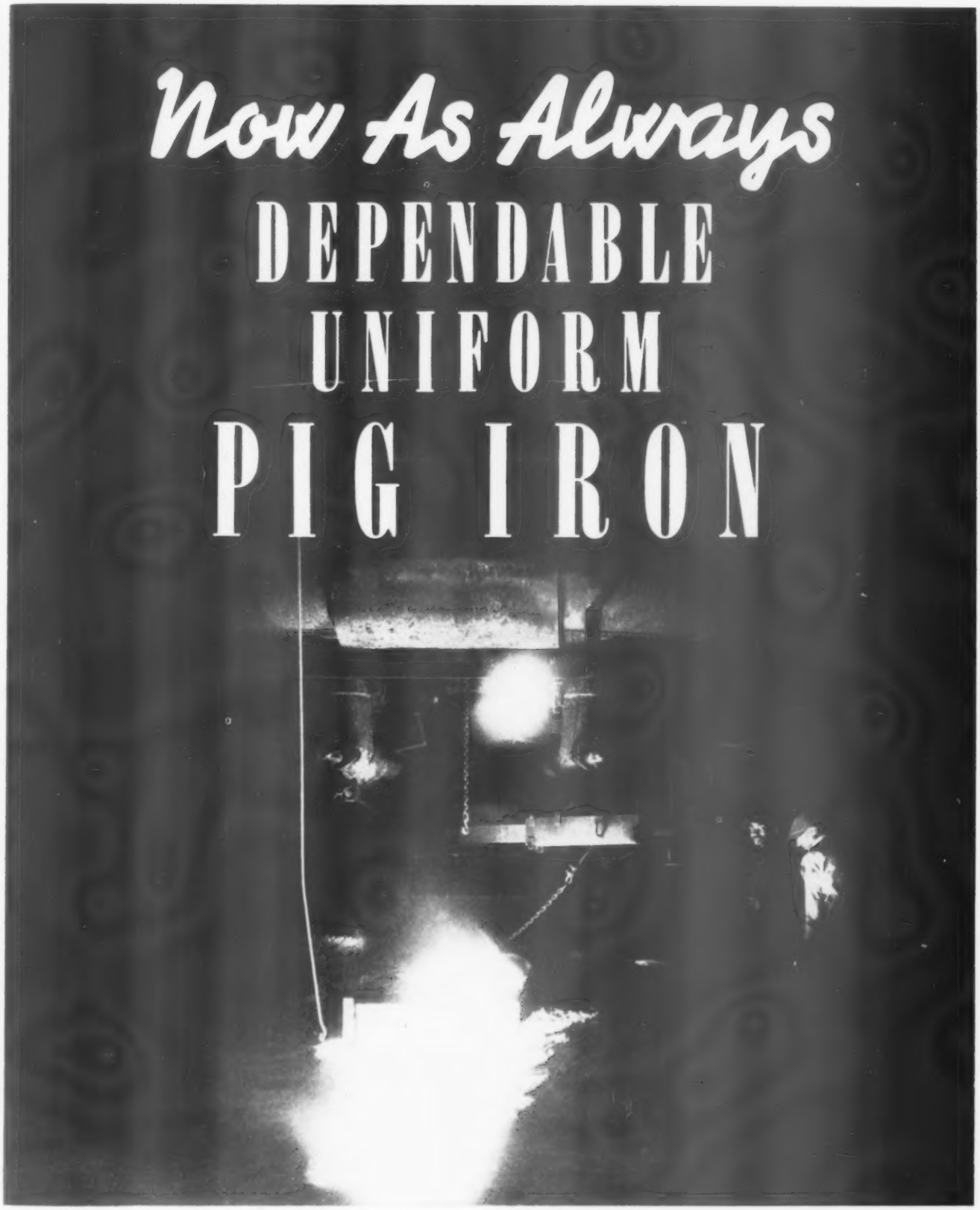
ALFRED W. GREGG

A. DOUGLAS HANNAH

EDWARD C. HOENICKE

Now As Always

DEPENDABLE
UNIFORM
PIG IRON



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(*Continued from page* 136)

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♦ ♦ ♦

Henry B. Hanley, recently elected president of the newly organized Rochester Chapter of the A.F.A. is foundry manager, American Laundry Machinery Co., Rochester, N. Y., and has had a long and active career in the foundry industry. Born in Attleboro, Mass., he attended the schools of Providence, R. I., and augmented his education with special work at Brown University and Massachusetts Institute of Technology. Mr. Hanley began his industrial career with Saunders & Franklin, Providence, and 9 years later became connected in various capacities with the New London Ship & Engine Co., Groton, Conn.; Holland Submarine Torpedo Boat Co.; General Ordnance Co., and General Alloys Equipment Co. In 1922 he became associated with Whitehead Bros. Co., New York, as manager of its testing department and consultant in foundry sand practice. For many years he actively promoted sand control in foundries by writing numerous papers on the subject and speaking before foundry groups. In 1923 he contributed the annual exchange paper of the A. F. A. on the subject of sand to the International Foundry Congress held in Paris. Mr. Hanley joined the American Laundry Machinery Co. in 1929, and in 1937 was elected a director of the American Foundrymen's Association.

♦ ♦ ♦

Roy G. Baysinger, chairman of the Northern Illinois-Southern Wisconsin Chapter of the American Foundrymen's Association, is foundry superintendent of the Geo. D. Roper Corp., Rockford, Ill., peacetime manufacturer of gas ranges and pumps. Except for three years with the Army Air Service in the last war, Mr. Baysinger has been connected with the foundry industry since 1916 when he started as a molder. From 1930 to 1936 he was with the Stover Mfg. & Engineering Co., Freeport, Ill., as foreman and assistant superintendent. After about a year on a special assignment with the Sibley Machine & Foundry Corp., South Bend, Ind., he returned to the Stover company in 1938 as foundry superintendent, and joined the Geo. D. Roper Corp. in 1940 as foundry superintendent. A charter member of his A.F.A. chapter, Mr. Baysinger has been active in committee work and served as vice chairman in 1942.

♦ ♦ ♦

Max T. Ganzauge, foundry superintendent of the General Railway Signal Co., Rochester, N. Y., has been elected a director of the Western New York Chapter of the A.F.A. to fill the unexpired term of E. P. Meade, who has left the foundry industry and is no longer a member of the association. Mr. Ganzauge also recently was named a director of the newly organized Rochester Chapter.

♦ ♦ ♦

Leighton M. Long, formerly chief metallurgist and foundry superintendent of the Bunting Brass & Bronze Co., Toledo, O., has been named an assistant research supervisor at Battelle Memorial Institute, Columbus, O. Mr. Long received his technical education in Canada. His career began as a chemist and analyst, and he entered the metallurgical field in 1922 with the Bohn Aluminum & Brass Co., Detroit. Active in the affairs of various technical organizations, Mr. Long has served as a director of the Toledo Chapter and member of the Nonferrous Practices committee of the A.F.A. and as chairman of the Toledo Chapter of the American Society for Metals.

♦ ♦ ♦

E. L. Berry, vice president and general manager of the Link-Belt Ordnance Co., has been elected vice president of Link-Belt Co., the parent organization. **Richard F. Bergmann,** company chief engineer, who went with Link-Belt in 1924 through purchase of the Howe Chain Co., Muskegon, Mich., also has been elected a vice president of Link-Belt Co., with headquarters at the company's general office in Chicago, as heretofore. Mr. Berry joined Link-Belt in 1914 and for many years has devoted his time particularly to production and personnel matters. He has been succeeded as manager of Link-Belt Ordnance Co. by **John E. Martin,** who started his Link-Belt association in 1927 and who since Pearl Harbor has been assistant to Brig. Gen. G. M. Wells, War Department, Washington.

♦ ♦ ♦

O. O. Lewis, formerly Atlanta, Ga., branch manager for Fairbanks, Morse & Co., Chicago, has been promoted to assistant general sales manager. **V. O. Harkness,** recently manager of the Dallas, Tex., branch, has been made manager of the diesel engine sales division, Chicago. **H. J. Renken,** manager of the oil field division at Dallas, also has been named branch house manager there. **J. S. Peterson,** formerly scale department manager of the Cincinnati branch, has been promoted to branch manager, succeeding the late Stanley Eaton. Mr. Lewis has been succeeded at Atlanta by **G. N. Van Epps,** formerly manager of the diesel department, Chicago branch.

♦ ♦ ♦

Lt. (jg) J. R. Wark now is stationed in the Pacific theater, and his address is Navy 14 AFGU, c/o Fleet P/O, San Francisco, Calif. Jack would like to hear from his friends back home. Before entering the service he was connected with the Queen City Sand & Supply Co., Buffalo, and was secretary of the Western New York Chapter of the A.F.A.

♦ ♦ ♦

John M. Crawford recently retired as president of the Parkersburg Rig & Reel Co., Parkersburg, W. Va., with foundry at Pomeroy, O., to become chairman of the company's board of directors, also director of the Consolidated Gas Co., which takes over all natural gas properties of Standard Oil Co. of New Jersey. He was born in County Derry, Ireland, and at the age of 16 arrived at Bradford, Pa. A few years later he

(*Continued on page* 140)

HENRY B. HANLEY

ROY G. BAYSINGER

MAX T. GANZAUGE

LEIGHTON M. LONG

THE LAST DROP IS AS GOOD AS THE FIRST

Ask the Men Who Use It!

It's As Simple As That . . .

There's no trick about getting good core room results. DAYTON Core Oil DOES THE WORK . . . and does it RIGHT! That's because of the constantly maintained UNIFORM QUALITY of Dayton Oils . . . now so important in foundries producing precision implements of war. If YOU are having core room trouble—call in the DAYTON Oil man. He can help you!

The

DAYTON OIL COMPANY

DAYTON • OHIO

STEEL CORE AND MOLD WASHES • BINDER AND CORE PASTE • CORE WASHES • CHILL COATINGS

(*Continued from page* 138)

established his own business to make and sell gas and oil well drilling machinery.

♦ ♦ ♦

L. E. MacFadyen, since 1940 superintendent of the High Bridge, N. J., plant of the Taylor-Wharton Iron & Steel Co., and a member of the staff since 1922, has been transferred to the same position at the company's plant at Easton, Pa. He has been succeeded at High Bridge by **E. O. Swearingen,** formerly superintendent of the fettling shop. The latter has been with the company since 1926.

♦ ♦ ♦

Eugene L. Bunting has resigned as nonferrous foundry superintendent of the Lunkenheimer Co., Cincinnati, to engage in consulting work among war plants troubled with defective castings. Mr. Bunting had been with the Lunkenheimer Co. since 1904 and had served successively as a coremaker, machine molder, furnace tender, in charge of the furnace room, and foreman. Since 1917 he had been superintendent of the nonferrous foundry.

♦ ♦ ♦

Gordon T. Williams, for the past 4 years metallurgist with the testing and research laboratories of Deere & Co., Moline, Ill., has resigned to become research metallurgist with the Pratt & Whitney Aircraft Division, United Aircraft Corp., East Hartford, Conn. From 1930 to 1939 he was metallurgist with Cleveland Tractor Co., Cleveland.

♦ ♦ ♦

V. C. Mekeel, recently superintendent of foundries of Ampco Metal Inc., Milwaukee, has resigned to accept the management of product engineering and sales development for Syncro Machine Co., Rahway, N. J. Mr. Mekeel has been active in the metals industry for the past 25 years in plant operation, engineering, metallurgical and sales capacities. Previously he was associated with the Bethlehem Steel Co., Taylor-Wharton Iron & Steel Co., Sivyer Steel Casting Co. and the Mekeel Engineering Co.

♦ ♦ ♦

Ralph H. Heberling, for the past 2 years assistant to the president in charge of manufacturing, has been appointed vice president of the Edward Valve & Mfg. Co. Inc., East Chicago, Ind. Mr. Heberling, who before joining the Edward organization was for many years a prominent Chicago area manufacturer and consulting engineer, will continue to supervise all manufacturing activities of the company.

♦ ♦ ♦

P. W. Stickney has been appointed sales representative in the Chicago territory for the Allen Corp., manufacturer of industrial ventilation equipment. Associated with Mr. Stickney at his headquarters at 549 West Washington Boulevard, Chicago, are **R. G. Rosenbach,** designing engineer, and **B. B. Harter** and **M. A. Norman,** sales engineers.

♦ ♦ ♦

James A. Ogilvie, prominently identified with the steel industry for the past 12 years, recently became general superintendent of the Atlantic seaboard division of Pittsburgh Metallurgical Co., Charleston, S. C.

♦ ♦ ♦

Charles D. Young, chemical engineer, has been appointed to the research staff of Battelle Memorial Institute, Columbus, O., and assigned to its division of nonferrous metallurgy. Previously he was an assistant in the department of chemistry of Ohio State University.

♦ ♦ ♦

Harold W. Buus has renewed his former position as supervisor of technical operations in the laboratory division of Stearns Magnetic Mfg. Co., Milwaukee. Mr. Buus joined the company upon his graduation from the South Dakota School of Mines and was with the firm several years when he was granted a leave of absence to take charge of the magnetic separations division of a prominent western mining operation.

♦ ♦ ♦

G. W. Dolan has been elected president of the Mathieson Alkali Works Inc., New York, succeeding **E. M. Allen** who recently announced his retirement, effective Jan. 1. Mr. Allen, president of the company since 1919, and since 1938 also chairman of the board, will continue as chairman. Mr. Dolan joined the Mathieson organization in 1930. He has held various responsible positions with the company, and in 1941 was elected executive vice president.

♦ ♦ ♦

Charles H. Junge has joined the Armour Research Foundation, Chicago. Previously he had been research metallurgist for National Malleable & Steel Castings Co., Cleveland.

♦ ♦ ♦

Robert Ryan has become foundry metallurgist for Bohn Aluminum & Brass Corp., plant No. 24, Adrian, Mich. Formerly he had been metallurgist with National Smelting Co.

♦ ♦ ♦

D. T. Wellman has been made head of a new branch office established by the Dow Chemical Co. in Cleveland. Formerly with the sales department at Midland, Mich., Mr. Wellman will be assisted at Cleveland by **T. H. Caldwell Jr.** of the company's magnesium production division.

♦ ♦ ♦

Alvin G. Cook, formerly connected with Allegheny Ludlum Steel Corp. at Dunkirk, N. Y., has been appointed metallurgist for Forging & Casting Corp., Ferndale, Mich.

♦ ♦ ♦

Otto E. Zahn has been appointed assistant works manager of the American Foundry Equipment Co., Mishawaka, Ind., with general supervision over all manufacturing operations. Since joining

(*Concluded on page* 143)

E. O. SWEARINGEN

EUGENE L. BUNTING

L. E. MAC FADYEN

GORDON T. WILLIAMS

Get more GOOD CASTINGS

DON'T lose sight of this fact . . . . Rejects can stall production schedules, slow deliveries to a walk, almost before you know it! That's another reason why so many foundry men are specifying Truline Binder. It saves time in ramming and baking, and, just as important, *Truline-bonded cores collapse quickly, eliminate the danger of "hot-tears."* Castings too are true to core-box dimensions, thus removing another cause for rejection. Write for information. Use coupon below.

Saves Time— these 3 ways

1 FORMS FASTER

Truline cores ram quickly, giving dense cores with freedom from sagging. *This means more cores per hour per core maker!*

2 BAKES FASTER

Truline cores harden under low oven heat, dry without oxidation. Oven-time is less, output greater!

3 CLEANS FASTER

Truline cores burn out readily. Core sand shakes out easily, saving valuable clean-up time.

TRULINE BINDER

Reg. U. S. Pat. Off.

HERCULES POWDER COMPANY
INCORPORATED
999 Market St., Wilmington 99, Delaware

Please send ☐ sample ☐ information on how to use Truline Binder in casting:

(state type of work and kind of metal cast)

Name _____ Title _____

Company _____ City _____ State _____ NB-41

Address _____

Not a Lemon in a Blue Moon

A very good reason exists why you'll have a hard time finding a mounted point or wheel with hard and soft spots among those bearing the Bay State *blue flash* trademark.

Bay State manufactures mounted points and wheels in *blank* form then shapes, trues and sizes them after mounting on the mandrel, in contrast to other makers' method of *pressing* into shape. The finished product is sharp, smooth-running the instant you touch it to the work — no wasteful "breaking-in" period required.

In a broad range of abrasive products, Bay State offers extra advantages... the finest honing and superfinishing stones ever manufactured... portable snagging wheels with extra safety features... precision grinding wheels in fractional grades...etc. Plus engineering assistance to help you get the most from grinding.

Do you have the handy, pocket-sized catalog of Bay State Mounted Wheels and Points? If not, send right away, for Catalog D.

BAY STATE ABRASIVE PRODUCTS CO.
WESTBORO, MASS.

BLUE FLASH GRINDING WHEELS *FAST and COOL*

HONING AND SUPERFINISHING STONES · CUT-OFF WHEELS · INSERTED-NUT DISCS AND CYLINDERS
PORTABLE SNAGGING WHEELS · MOUNTED WHEELS AND POINTS · GRINDING WHEELS

(*Concluded from page* 140)

the company in 1937 Mr. Zahn successively has been development engineer and acting general superintendent. Previously he operated the consulting firm of Zahn Engineering Co., West Allis, Wis.

• • •

R. R. Campbell, formerly chief metallurgist for MacKinnon Industries Ltd., St. Catherines, Ont., is now metallurgist with Centrifugal Casting Co., Muskegon, Mich., a new company recently organized by W. Hall, A. G. Anderson and R. B. Lange.

• • •

A. C. Hamilton, for many years actively connected with industrial manufacturing in the Detroit area, has been

A. C. HAMILTON

appointed Michigan representative of the National Smelting Co., Cleveland, manufacturers of aluminum and magnesium alloys.

• • •

R. D. Ulrey has been appointed manager of the new Los Angeles office of the Crocker-Wheeler Electric Division of the Joshua Hendy Iron Works, with headquarters in the Pacific Mutual building. Mr. Ulrey had been associated with U. S. Electric Motors Inc., Los Angeles.

• • •

W. J. Barclay, formerly personnel director for Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich., and active with that company for 9 years, is now associated with the personnel department of Vickers Inc., Detroit.

• • •

Joseph Axelrod, Pennsylvania Smelting & Refining Co., Philadelphia, was re-elected president of the Philadelphia Metals Association at the fifteenth annual meeting of the association.

• • •

C. Howard Paul, treasurer and assistant to the president of the Mackintosh-Hemphill Co., Pittsburgh, and **Edmund L. Stewart,** treasurer of the Sandusky Foundry & Machine Co., Sandusky, O., have been elected to membership in the Controllers Institute of America.

• • •

L. V. Tuttle has been appointed foundry manager of the Gisholt Machine Co., Madison, Wis. He had been associated in a similar capacity with the Koehring Co., Milwaukee, for the past 12 years.

• • •

Frank Weisehan, formerly metallurgist, Ferro Machine & Foundry Co., Cleveland, has been appointed superintendent of foundry, core room and mill room. He has been associated with the company since 1915 when he started as a chemist. **Arthur Tumpach,** formerly assistant metallurgist, has been appointed metallurgist in charge of all melting operations. He has been connected with the firm since 1923 when he began as chemist. **Rex J. Myers,** formerly assistant superintendent of machine shops, has been appointed equipment engineer in charge of design and maintenance of all foundry machinery. He has been associated with Ferro Machine & Foundry Co. since 1922 when he started in the tool room.

• • •

Thomas H. Glaser has been appointed installation engineer and tooling consultant for the Gray-Mills Co., Chicago, maker of portable coolant systems and industrial fluid coolers.

• • •

James W. Yanda has been appointed general manager in charge of research chemical development engineering for Chemical Research for Industry Inc., Cleveland.

• • •

Frank W. Wells, formerly assistant to the vice president in charge of production of the J. I. Case Co., Racine, Wis., has joined the staff of the president of the A. O. Smith Corp., Milwaukee.

• • •

Carl F. Mayer, president, the Carl Mayer Corp., Cleveland, has been appointed a member of the Heat Treating Equipment Advisory Committee of the War Production Board.

• • •

French E. Bassett, who has been made manager of the new Tilton, Ill., plant to be operated by the Saginaw Malleable Iron Division of General Motors Corp., Saginaw, Mich., as reported in THE FOUNDRY, December, p. 134, recently had been production manager at Saginaw. Mr. Bassett joined the division 25 years ago as a foreman in the shipping department. In 1922 he became production manager of material supplies, and 11 years later he was transferred to the sales department, subsequently becoming sales manager. In 1941 he was given the added responsibilities of defense coordinator of the plant.

• • •

Henry W. Ufer has been appointed operating manager of the Griffin Wheel Co., Chicago, succeeding Herbert J. Rosen who has been elected vice president in charge of operations. Mr. Ufer has been associated with the company since 1902 when he started in the drafting room, and recently had been in charge of the order and equipment division. For a number of years he supervised work on the design of foundries, later transferring to the operating department to become superintendent in

HENRY W. UFER

charge of operations at both the Detroit and Denver plants from 1907 to 1910. Mr. Ufer has been active since 1904 on the Wheel Design committee of the Manufacturers of Chilled Car Wheels, designing the chilled iron car wheels adopted for freight car service by the Association of American Railroads. He is also an active member of the American Foundrymen's Association and a past president of the Chicago Foundrymen's Club.

Foundry Equipment Orders Down

Index of orders for foundry equipment in November totaled 328, compared with 375.7 in October and 286.1 in November, 1942, according to a recent report of the Foundry Equipment Manufacturers Association. The base of 100 per cent in the index represents the monthly average of sales during 1937-38-39.

Peters-Dalton Inc., Detroit, formerly known as the Industrial Sheet Metal Works, engineer and manufacturer of dust collectors and spray booths, drying ovens, ventilating systems, and special factory equipment, has opened an office in Indianapolis at 1412 Circle Tower.

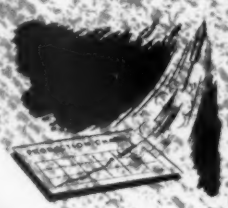
THE AIRLESS WHEELABRATOR Hurls More Than

BONUS-BENEFITS FROM WHEELABRATING

Faster machining and grinding, simplified inspection, and lengthened tool life result from Wheelabrator cleaning, because sand and scale are scoured away from every pore, fissure and fillet.

A Michigan Foundry says: "Our milling cutters used to last for only 400 to 500 jobs; now, after Wheelabrating, the cutters turn out in excess of 1500 jobs before replacement is necessary." ● An Ohio manufacturer says: "The machine not only enables us to give a finer appearance to our products, but has shown a considerable saving in grinding and grinding wheel costs."

HITCHING PRODUCTION TO A SKYROCKET



A 24 hour job for 2 sand blast tables and 4 operators in cleaning steel castings was reduced to 16 hours and a single operator with one Wheelabrator at General Railway Switch Co., Rochester, New York. ● Elmira Foundry Co. reduced the cleaning of 500 lb. loads of hard iron from 30 minutes to 5 minutes by Wheelabrating. ● Red Jacket Manufacturing Co. replaced 8 large mills with one Wheelabrator and increased production 40%. ● At Birdsboro Casting Co., Inc. the Wheelabrator reduced cleaning time from 24 hours to 7 hours.

PUTTING HIGH COSTS ON THE TOBOGGAN

Cost studies made in the plants of hundreds of customers show that the Wheelabrator pays for itself within 6 to 18 months. Here are some typical savings: By installing a 6′ Wheelabrator Tablast the Fulton Foundry and Machine Co., (Cleveland) effected savings of $23.60 per day. ● New York Airbrake Co., Watertown, N. Y., reduced cleaning costs from $3.96 per ton, using sand blast barrels, to $1.56 per ton with a Wheelabrator, thus saving $2.40 per ton.

ARMY E NAVY

THE AMERICAN WHEELABRATOR TRADE MARK REG. U. S. PAT. OFF.

SEE American FIRST

WORLD'S LARGEST

280,000 Shot* Per Second!

Visualize that terrific cleaning power in terms of high speed cleaning and lower costs and you've got the answer to your cleaning problem.

WITH practically every tick of the clock the Wheelabrator sends a flood of more than 280,000 steel shot racing to action . . . . or close to 17 million in a single minute's time!

Cleaning power like this has three important effects: It reduces costs; speeds up production by reducing cleaning time to a fraction of that ordinarily required; and it produces lustrous surfaces that are perfectly clean.

The veritable avalanche of abrasive thrown by the Wheelabrator under perfect directional control (300 to 500 lbs. per minute) scours and blasts away every particle of sand and scale right down to the virgin metal, leaving the surface in perfect condition for fast machining and grinding or for bonding with final finishes.

For the answer to your problem of revitalizing sluggish cleaning production and correcting abnormal cleaning costs we suggest that you investigate the Wheelabrator speed-cleaning process.

More than 2000 machines now in use.

*No. 20 (.05" dia.) Wheelabrator Shot — a commonly used size.

American

FOUNDRY EQUIPMENT CO.

505 SOUTH BYRKIT ST. MISHAWAKA, IND.

BUILDERS OF AIRLESS BLAST EQUIPMENT

Among DETROIT Foundries

BY A. H. ALLEN
Detroit Editor,
The Foundry

Foundries face choice of making their industry more appealing to boys and young men or of increasing plant mechanization. . . Leaders of tomorrow not being developed today. . . . Nash foundry converts to aluminum

OCCASIONALLY when the pressure for production eases momentarily, foundrymen find a few minutes for retrospect and a critical self-examination for the purpose of trying to find out where they are going and how they are going to get there. Conclusions reached often are sad, being wrapped up intimately with the fact that despite its basic character the foundry industry is not attracting young men in a sufficient quantity to insure a sound future.

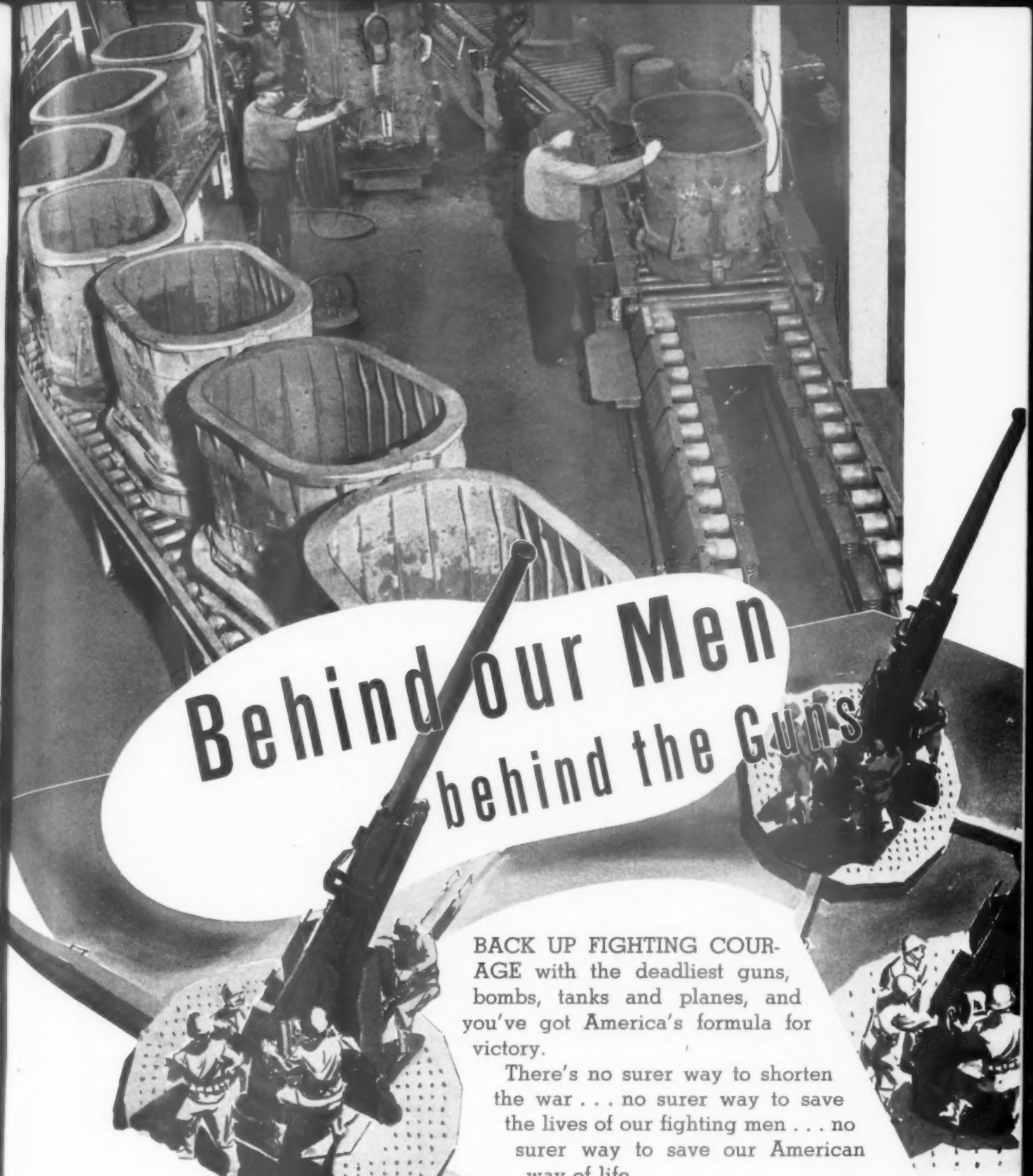
Too many foundries are dirty, drafty places to work, and the pay too often is not commensurate with that obtainable in many other classes of work. The acceleration brought all industry by the war has accentuated the plight of foundries, bringing tremendous difficulties in persuading even the lowest level of common labor to stay on the job. There are so many seemingly more desirable jobs competing for labor that foundrymen appear continually behind the 8-ball.

Many of the smaller so-called independent foundries are what might be termed "family" institutions, in which one man or a group of men pull the operating strings and neglect to build up a capable force of substitutes in the younger ranks to carry on the business when they are forced to retire. Meanwhile in schools and colleges, the foundry industry has not received the attention given other branches of technology, with the result young men of the age to enter industry have little appreciation of the opportunities in the foundry field. This is not to deprecate the many sincere efforts which are being made in the institutional field to broaden knowledge of metal casting. The trouble is these efforts are not broad enough and do not receive sufficient active support from the industry.

Today with so many thousands of young men serving in the armed forces just at the time when they might be determining their future careers in business, a golden opportunity presents itself to foundrymen to map out plans to "sell" their industry to returning servicemen. Selling does not mean simply advertising in glowing praises the opportunities which may or may not be ready for plucking, but rather the renovating of plants and policies to the point where they become attractive to newcomers. To be attractive, a plant must be a pleasant and healthful place to work, it must offer distinct possibilities for good earnings and chance for advancement, it must look to a future ripe with expanding markets for the product, and its leaders must have a full appreciation of the "humanics," as Ralph Lee of General Motors calls it, in addition to the "mechanics" of the in-

(*Concluded on page* 149)

Girls in General Electric Co. plants are now operating portable 1,000,000*-volt x-ray cameras built by the company The operator shown is setting the equipment to inspect a large casting before it is machined. The tube will make a picture through 4 inches of steel almost as if it were made of glass*

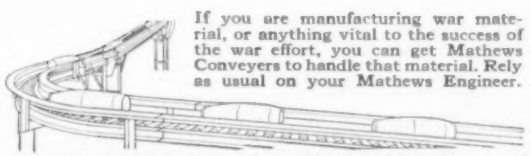


Behind our Men behind the Guns

BACK UP FIGHTING COURAGE with the deadliest guns, bombs, tanks and planes, and you've got America's formula for victory.

There's no surer way to shorten the war . . . no surer way to save the lives of our fighting men . . . no surer way to save our American way of life.

Speeding up assembly . . . removing production bottlenecks . . . preventing hitches in the speeding movement of vital war materials is Mathews' contribution to America's war effort.

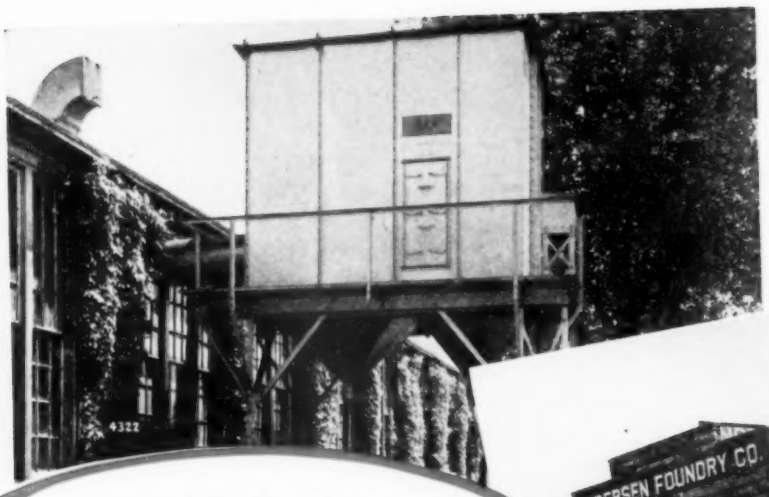


If you are manufacturing war material, or anything vital to the success of the war effort, you can get Mathews Conveyers to handle that material. Rely as usual on your Mathews Engineer.

MATHEWS CONVEYERS FOR MECHANIZED PRODUCTION

MATHEWS CONVEYER COMPANY

ELLWOOD CITY
PENNSYLVANIA



Close-up of Sly Dust Filter.

Sly Dust Filter alongside of foundry building. Fan is inside of building with exhaust pipe shown above roof.

SLY DUST COLLECTOR Improves

WORKING CONDITIONS

In Busy Foundry

Close-up of end of Sly Dust Filter showing shaker drive, housing and support.

THIS collector was purchased 15 years ago to collect dust in foundry operations from a blast mill, two tumbling mills and seven grinders. It is still being used for the same purpose.

"It does its work very well," says the Andersen Foundry Co. It maintains good working conditions so that the men can work to advantage and like it. It is economical on maintenance and power.

Sly Dust Filters provide exclusive advantages in (1) greater filtering capacity, (2) saving power, (3) easier bag replacement, (4) automatic control, and (5) savings in operation and maintenance.

Ask for Bulletin 98 and tell us your problem so that we can write you fully.

THE W. W. SLY MANUFACTURING CO.
Since 1874
4753 Train Avenue Cleveland 2, Ohio

SLY INDUSTRIAL DUST CONTROL

TUMBLING MILLS ★ BLAST CLEANING EQUIPMENT

Detroit Foundries

(*Concluded from page* 146)

dustry. Making a good employe is just as important these days as making a good casting.

When war production eases, as is already happening in some fields, foundry operators must have their plans ready to move into civilian and peacetime markets on a profitable basis. They must be just as concerned with making jobs for their workmen as with figuring out some way to knock a tenth of a cent a pound off their castings so they can grab off some choice business from competitors. They must realize that good housekeeping, good light and ventilation, and good equipment may be even more important than meeting a tensile strength specification.

If this sounds like perfunctory editorializing, it is just because foundrymen in this area, and doubtless in other sections as well, are thinking about these things. They are stacking their present difficulties up against postwar operation and trying to find the answers.

Time is taking its toll of many of the once-great names in the foundry field—names which were synonymous with the names of the companies they served. Take the single case of Campbell, Wyant & Cannon at Muskegon, one of the largest independent steel foundries in the business. In recent months, C-W-C has lost through death one of its founders, Don Campbell; its venerable and respected sales manager, Fred Whitlock; and its production chief, Sam Huber. At least five other important cogs in the organization have left for other work. Their replacement is no simple task, but of course it will be done. Less efficient plants might have suffered irreparably under such losses.

Machines Replacing Men

There are some who think education and promotion can be combined intelligently to draw fresh talent to the foundry industry. There are others who think it may be a lost cause; that the survival of the industry depends in large measure on its increased mechanization, conveyorization and automatization—in other words, building the skill of the experienced foundrymen's hands into the machine. To a considerable degree the automotive foundries have done this, with the help of greatly improved molding machines, coreblowing units, mechanical sand handling systems, etc. These devices have left their operators free from too much dependence on the inherited skill of the journeyman molder and coremaker. Will not smaller foundries have to proceed in the same direction?

Where are the practical leaders of the foundry industry of tomorrow? Where are the grammar-school and high-school boys who start out as foundry apprentices at the age of, say, 14 or 15 and work up through the ranks the hard way to become foundry leaders of 1970 and 1980? Today, they just ain't. Unless this situation can be corrected, the obvious answer is to require our designers and mechanical engineers to build the skill of these veterans into the cold and unresponsive metal of foundry equipment.

One of the newest of the automotive foundries to be converted to aluminum is the Nash Motors gray iron plant in Kenosha which is now producing cylinder heads for the Pratt & Whitney 2000-horsepower engine being built by Nash. Beyond tearing out an old core room, and rearranging materials handling facilities, the job of conversion was not too difficult (four 14-ton per hour gray iron cupolas were undisturbed). The foundry is now turning out close to 20,000 heads a month, being still about 25 per cent short of peak output. Heads produced are conventional types, such as produced by Buick at Flint, except that they are somewhat larger. Support wires are used in the finned portion of the mold, around 800 per casting. Metal is alloyed in crucible furnaces at the plant, using about 20 per cent return scrap. About 50 pounds of metal must be poured for each 25-pound head. Scrap is melted in a reverberatory furnace and cast into pigs for remelt.

Some interesting figures are reported on cost of certain aircraft engine magnesium castings. One example is a complicated supercharger housing for a large radial engine. The casting in the rough weighs 100 pounds and costs the engine builder a neat $503, or better than $5 per pound. Rejects in machining are said to run as high as 20 per cent, and scrap at the foundry as high as 70 per cent.

Plan Program for A.F.A. Congress

(*Concluded from page* 127)

on "Heading and Gating" has been scheduled under the chairmanship of William G. Reichert, Reichert Engineering Co., Newark, N. J. As previously mentioned, this subject also will be treated in a Malleable division symposium. Foundry training work will be covered in sessions sponsored by three committees—Apprentice Training, Foreman Training, and Co-operation with Engineering Schools.

Tentative outline of sessions of the Divisions and General Interest committee follows:

Tuesday, April 25

A.M.—Registration
Opening Meting
P.M.—Aluminum and Magnesium Practice
Malleable Practice
Plant and Plant Equipment
Foreman Training
Refractories
Enginering Training
Sand Shop Operation Courses

Wednesday, April 26

A.M.—Brass and Bronze Castings Practice
Malleable Practice
Gray Iron Practice
P.M.—Inspection of Castings
Malleable Practice
Aluminum and Magnesium
Steel Casting Practice
Gray Iron Castings
Sand Research
Apprentice Training
Shop Operation Courses

Thursday, April 27

A.M.—Business Meeting and Awards Lecture
P.M.—Brass and Bronze Practice
Steel Castings
Gray Iron Castings Practice
Aluminum and Magnesium
Safety and Hygiene
Sand Research
Job Evaluation and Time Study
Shop Operation Courses

Friday, April 28

A.M.—Steel Casting Practice
Pattern Making
Gray Iron Practice
P.M.—Steel Castings
Centrifugal Casting Practice
Heading and Gating
Shop Operation Courses
A.F.A. Annual Dinner

Buffalo will be the site of the convention for the first time since 1912, and the Western New York Chapter of the A.F.A. actively is preparing to act as host on the occasion. Various committees appointed by the chapter now are working on arrangements.

The Housing and Hotel committee, under the chairmanship of A. J. Heysel, E. J. Woodison Co., has been functioning for several months. Other members of this committee include: Erwin W. Deutschlander, Worthington Pump & Machinery Corp.; William S. Miller, Charles C. Kawin Co., and Harold J. Struebing, Electro Refractories & Alloys Corp. All requests for Buffalo hotel reservations during the congress are being handled by A. J. Morgan, manager, A.F.A. Buffalo Housing Committee, Genesee Building, Buffalo.

Officers of the Western New York Chapter are: Chairman, Frank E. Bates, Worthington Pump & Machinery Corp.; vice chairman, Reinhold D. Loesch, Lake Erie Foundry Co.; secretary, J. Ralph Turner, Queen City Sand & Supply Co.; treasurer, Martin W. Pohlman, Pohlman Foundry Co. Inc.

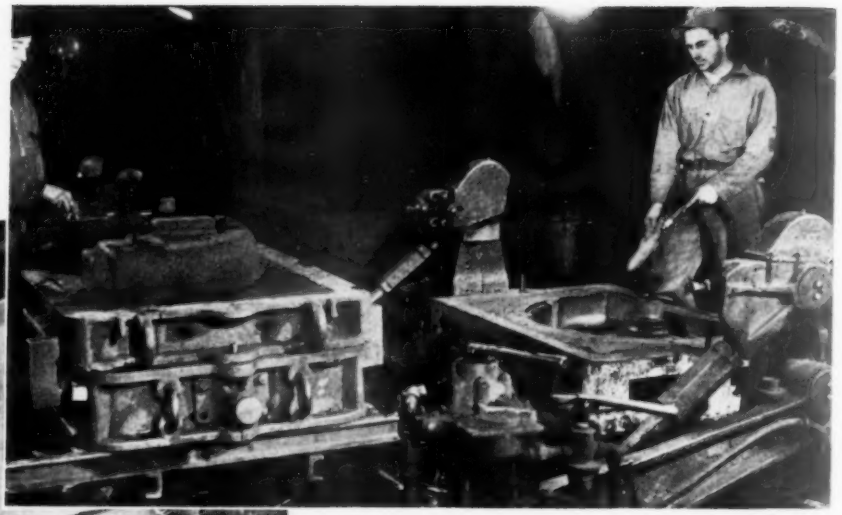
Rockwell Purchases Gehnrich Corp.

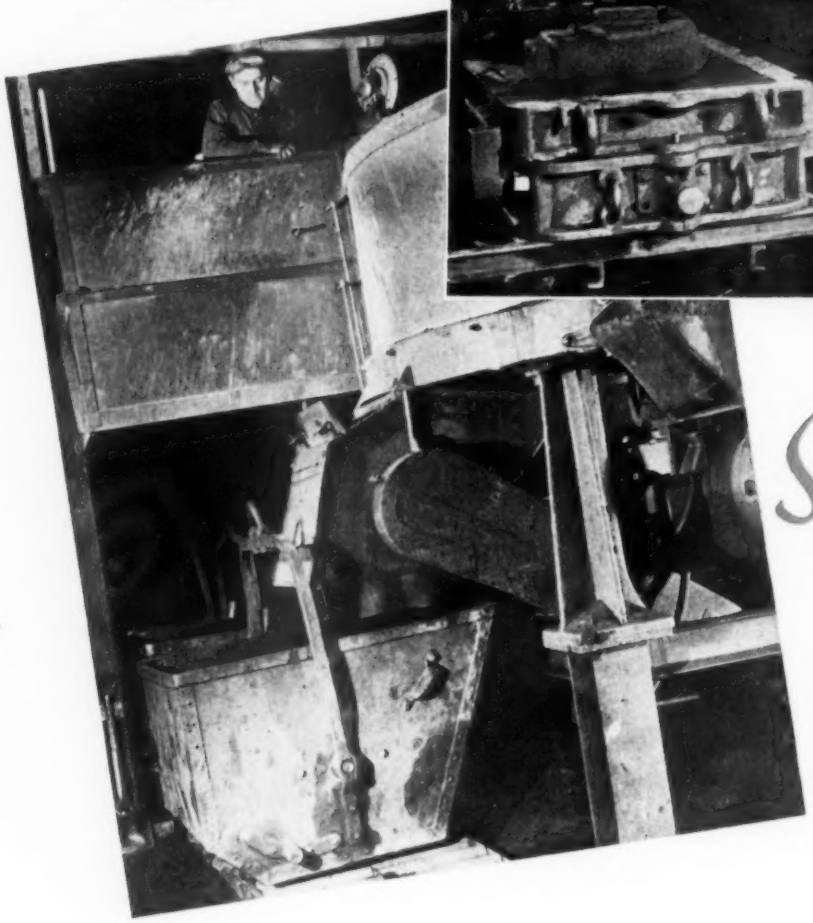
The Gehnrich Corp., Long Island City, N. Y., has been purchased by the W. S. Rockwell Co., New York, and is being operated as the Gehnrich Oven Division of the latter company. Under the management of A. V. Maday and A. H. Sherman, who will retire from active business, the Gehnrich Corp. had become one of the largest manufacturers of batch type and conveyor ovens for heat processing operations in the metalworking, chemical and allied industries. The engineering, manufacturing and sales personnel of the company will be retained under the new management.

Gray Iron Society Membership Rises

Membership in the Gray Iron Founders' Society in December was at a new record high of 739 foundries in 42 states and Hawaii, according to W. W. Rose, executive vice president. This is a net increase of 111 regular and manufacturing memberships since a year earlier.

Fig. 1 (right)—Synthetic sands prove especially suitable for high production with metal patterns. Little if any patching is necessary. Fig. 2 (below)—Sand and bonding materials are mixed thoroughly to insure uniform characteristics





Sand Control Reduces CASTING REJECTS

By D. W. GUNTHER
Westinghouse Electric & Mfg. Co.
Trafford, Pa.

INVESTIGATIONS of the physical action of the numerous constituents of foundry sands under various conditions are resulting in a better understanding of the behavior of molding sands under those conditions. The present-day foundryman has a great deal of this information at his command which can help solve sand problems and can point the way to better sand practices.

Definition of a synthetic sand indicates that the basic materials are sand and clay plus other materials which give desirable properties to the sand mix. The proper selection of the base sand, the clay or clay combination, and the other materials are very important to the development of a suitable sand.

Best type of base sand for a synthetic mix is an unbonded, graded sand of the proper grain fineness to meet the molding requirements. If the cost of such a sand is excessive, it would be more desirable to use a local low-bonded natural sand of suitable characteristics than to pay a premium for the unbonded sand. It should be remembered that the sand entering the system through the cores should be of a similar type to the base molding sand. This is especially true if, as often happens, the only sand entering the system is core sand. In this case, the system will finally be composed entirely of the core sand. If the proper core sand is not used the molding sand will not have the properties originally intended.

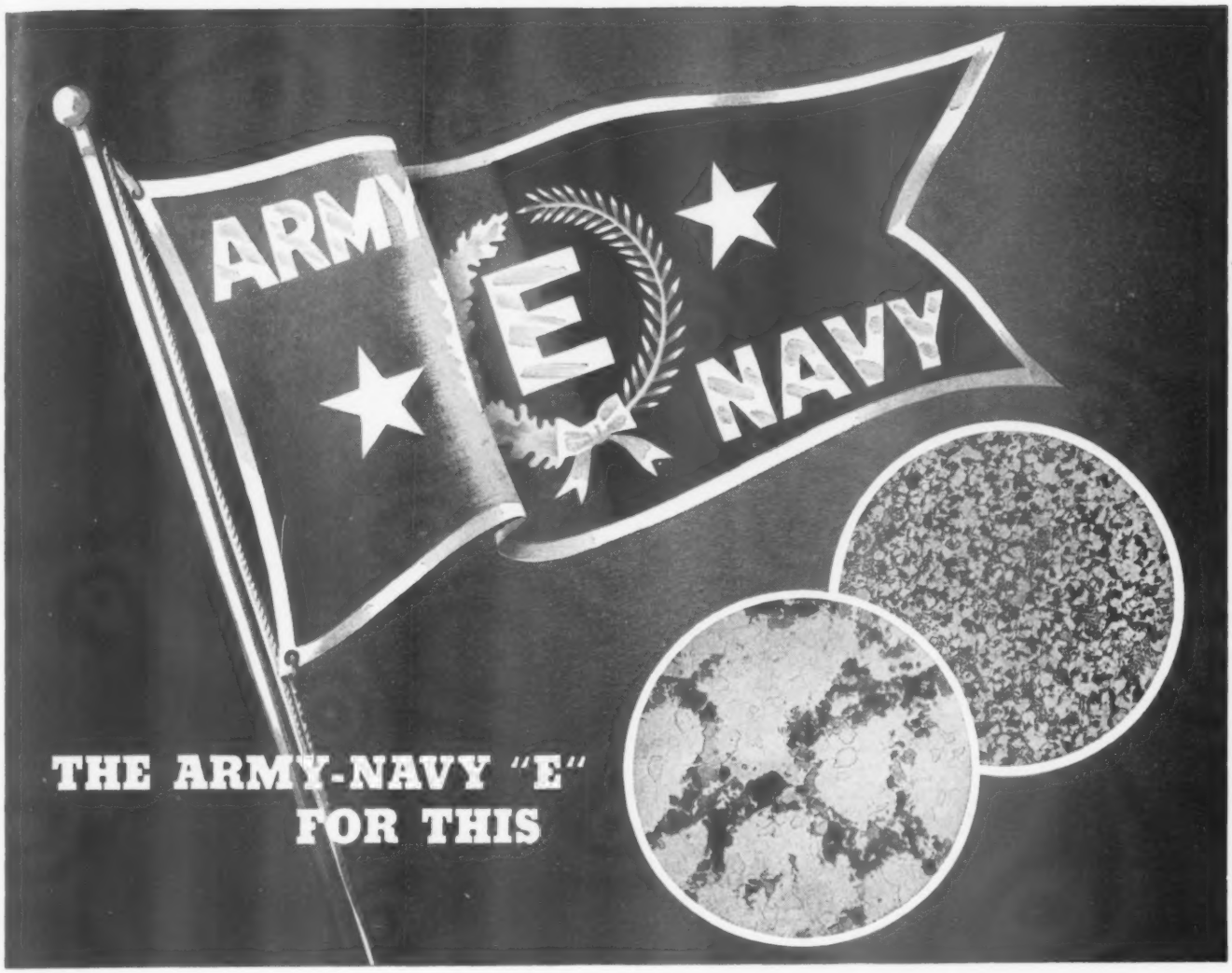
The important factors to be considered about a base sand are: 1. Grain size, shape and distribution; 2. Clay content; 3. Refractory value.

All of the physical properties of a subsequent sand mix, as well as the surface finish of the castings, are dependent upon the selection of a base sand of proper grain size, shape and distribution. The smallest grain size giving the required permeability should be used to produce the best attainable surface finish on the casting.

Clay content of the base sand is important because it affects the refractory value and permeability of the sand. It should be remembered when testing base sands for clay content that the standard A.F.A. clay wash not only measures the active colloidal clay but also any material of such fineness that it will be removed by the test. Importance of the refractory value of the sand is evident and is affected by contaminants, particularly iron oxide.

There are three classes of bonding clays which generally are available to foundrymen at the present time. Practically any desired property in a sand that is dependent upon the bond can be obtained by the use of the proper available clay or clay combination. Detailed information about clays is available from many sources which, while not complete,

(*Concluded on page* 152)



On September 5th, 1942, our Mine and Mill at Climax, our Research Laboratory at Detroit and our Conversion Plant at Langeloth, Pennsylvania, were given the Army-Navy Production Award. Since then the award has been twice renewed. The two-starred flag we fly represents a full year of contribution to the war effort recognized by the Army and Navy.

Winning the award by the laboratory began in 1931. It was then that it was founded to meet our needs for authoritative information about molybdenum—containing ferrous materials.

Pearl Harbor intensified our work with producers of war equipment—work that is aided considerably by the accumulated data and experience gained in over ten years of concentrated research.

We are particularly proud to be among those companies whose laboratories are entitled to fly the Army-Navy "E".

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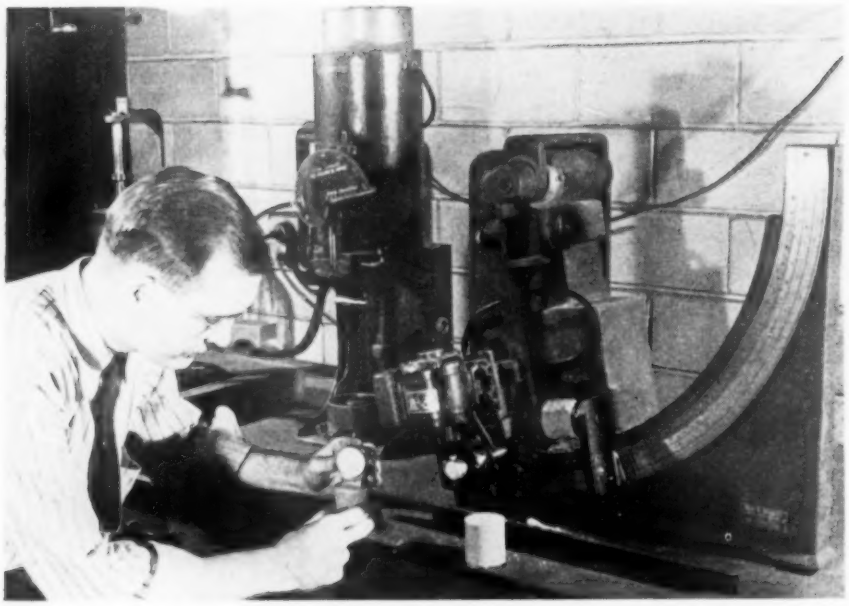


Fig. 3—Samples of each type of synthetic sand are tested at least twice daily to insure uniformity. Tests are made for permeability, hardness, strength and porosity

(*Concluded from page* 150)

offer a good starting point in the development of a synthetic sand.

Clay is the constituent of a molding sand which bonds the sand particles together. All the strength properties of a sand increase as the amount of clay is increased while permeability and flowability decrease. To obtain the best results from a minimum amount of clay, it is necessary to mix the sand and clay thoroughly so that each sand grain will be coated uniformly.

The three available classes of bonding clays are classified by their dominant mineral. These classes are (1) kaolinite, (2) illite, and (3) montmorillonite. The montmorillonites generally are known better as the bentonites and may be subdivided into the southern and western bentonite, each of which has very characteristic properties differing from the other.

The kaolinites, fire clays and ball clays have low initial cost and high durability as well as good refractory properties. They often are used on heavy dry sand work, and for this usually require auxiliary binders. The illite clays are the least refractory of the three classes. They do have good flowability, good collapsibility, and a low retained strength.

Southern bentonites produce high green strength, have high flowability and high collapsibility. Western bentonites will exhibit high dry strength, good green strength, and good durability. It often is possible to combine clays and obtain more satisfactory properties from the combination than is obtainable with either clay alone. This fact is being appreciated more fully and has enlarged the field of sand development tremendously.

Auxiliary materials usually are used in synthetic sand practice to obtain properties which are not reasonably obtained in any other way. The most common of these materials are seacoal, pitch, resin, cereal, and silica flour. Moderation is necessary in using these materials as often too much of them does more harm than good.

Seacoal is a common addition to sand systems making gray iron castings which require good surface finish. The seacoal seems to produce a carbon film which blankets the mold walls to resist metal penetration and also the formation of a gas of reducing nature which tends to counteract the oxidizing effect of steam. Use of seacoal is limited to those metals not adversely affected by its carburizing action.

Pitch generally is used to obtain high dry strength unobtainable otherwise. The green strength of the sand mix also may be improved somewhat, and some information indicates that hot strength may be increased by its use. Pitch is volatilized only at a high temperature so can stand up under the normal baking time and temperature of large cores and molds without serious deterioration.

Resin has the same general effect as pitch but is more sensitive to the time and temperature of baking because it has a lower volatilization temperature. Ordinarily it is used on smaller work than is pitch.

Cereal is very commonly used to improve green strength of a sand mix but dry strength also may be increased by its use. The effect of other materials present may affect the properties of cereal. Available information indicates that cereal increases the hot strength of the southern bentonite sand mixes and decreases the hot strength of the western bentonite mixes.

Silica flour often is used by steel foundries to increase the refractory properties of the sand, improve surface finish, and prevent metal penetration. It increases all the physical properties of a sand mix except permeability and flowability and, because of its effect in greatly increasing the hot strength and expansion properties of a sand mix, should be used carefully and moderately.

Synthetic sand is used to a great extent in iron and steel foundries but is equally applicable to the nonferrous industry. This may range from the use of small quantities of synthetic sand for specific applications, to the use of synthetic sands throughout the shop. The use of small quantities may have merit for specific jobs requiring particular sand properties which a synthetic sand may be particularly adapted to meet.

Book Review

A. S. T. M. Methods of Chemical Analysis of Metals, cloth, 323 pages, 6 x 9 inches, published by the American Society for Testing Materials, 260 South Broad street, Philadelphia, price $3.

Intensive work by the American Society for Testing Materials committees E-3 on chemical analysis of metals and E-2 on spectrographic analysis has resulted in the publication of this 1943 volume which contains two sampling methods, 17 standard and tentative methods of which 4 are for analysis of ferrous metals, 10 for nonferrous, and 3 are on quantitative spectrochemical procedures for nonferrous metals. An important new feature is the tentative recommended practice for apparatus and reagents for chemical analysis of metals. Other helpful material published as information gives methods for chemical analysis of special brasses and bronzes and of white metal bearing alloys; also a procedure for aluminum in solder metal, and methods of sampling wrought metals and alloys for determination of chemical composition.

Form New Company

Louis G. Berman & Associates, foundry representatives, have merged with H. J. Sanders, manufacturers' representative, to form the sales organization Sanders-Berman Associated with headquarters at 43 East Ohio Street, Chicago 11.

Made Representative

Halbert & Hansen, 411 Standard Bldg., Atlanta 3, Ga., have been appointed representative of the Cleveland Quarries Co., Cleveland, for the sale of silica firestone in Alabama, Georgia, South Carolina, Florida and Mississippi.

Delta "E" Renewed

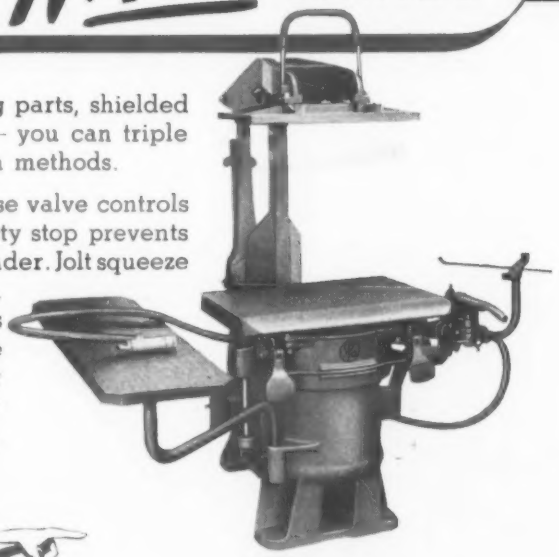
Delta Oil Products Co., Milwaukee, has been advised by the War Department that it has won the Army-Navy "E" for the second time. The pennant originally was awarded the company more than 6 months ago.

For SPEED, PRODUCTION, PROFIT—the SPO *No. 100* SERIES

The SPO No. 100 Series air-operated Jolt Squeeze Molding Machines give you both cope and drag molds *with great speed and accuracy*.

They excel on a wide variety of work involving matchplates and gated patterns. Handy and easy to operate, with vibrator knee valve, jolt knee valve, squeezer-operating valve, blow valve, riddle rack and closing bench all located for quick action. Nothing to "understand"— unskilled labor "catches on in no time". Molds uniformly accurate, due to balanced design and rigidity throughout. Few moving parts, shielded from sand and grit. Very fast — you can triple your output over hand or bench methods.

Also. Automatic pressure release valve controls squeeze pressure of molds. Safety stop prevents squeeze piston from leaving cylinder. Jolt squeeze insures evenly packed molds. Open-end squeeze head permits use of extra long flasks. Squeeze plate adjustable in 2" steps for various flask heights. Points for lubrication conveniently placed.



Cantilever or post type squeeze heads.
Stationary or portable models.
Range of sizes.

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the adventures of BILL

(*Continued from page* 111)

mildly of course—your somewhat—ah—crude method of phrasing your questions. The charge of laziness is particularly inappropriate. If I was lazy do you think I would be sitting here wearing my two index fingers down to the quick, while the babbitt runs out of the typewriter bearings? Ridiculous! If you had your way I suppose you would have me stand up at the job instead of sitting here comfortably in an easy chair with my feet propped up on a cushioned bench and with a cute little typewriter (machine) resting on my knees.

The story of how, where and when, as you bluntly put it, I first laid my paws on Bill, how did I slip him into THE FOUNDRY, how did I maintain amicable relations for 30 or 40 years, and how did I tap him at regular intervals for expression of opinion on an exceedingly wide range of subjects is—if you will pardon the expression—a rather long story. However, before beginning the story I think it is my plain duty to comment briefly on a few points in the foregoing charge, statement or indictment.

I have already, at least to my own perfect satisfaction, disposed of the charge of laziness. Laying on the paws is a new and therefore strange term to me. If it means extending the hands in a sudden and violent manner with the object of inflicting a severe blow or buffet, I confidently can plead not guilty. On the other hand if the term is used in a figurative sense, meaning the date on which my acquaintance with this sterling character began, then the answer is shortly after the Armistice was signed in November, 1918. Surely that is specific enough. I don't remember the exact day nor the hour, but as Harry Lauder remarks in one of his tuneful ditties, "It was near-r-r the end o' the week, anyway!" when Bill's topmasts first appeared above my mental horizon.

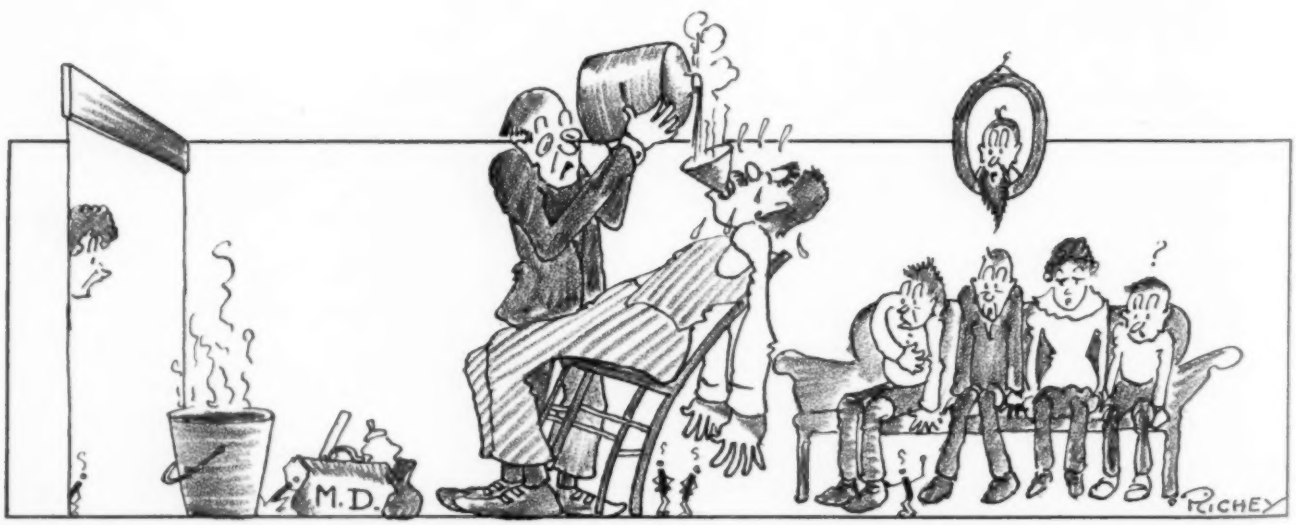
A detailed and factual account of how I slipped him into THE FOUNDRY will be presented in a moment or two. Pray continue. The account, I hope will serve as a guide, a beacon light to ambitious foundrymen here and there who now and again have felt the urge to submit a contribution to this worthy publication and have their names and pictures appear on the printed page. By way of encouragement I might say the process is quite simple. All the prospective author needs is a pen, a pencil or a typewriter and a few sheets of paper. The work is greatly facilitated if the writer has an idea or two, plus the necessary skill and patience to set down one word after another in orderly and proper sequence and in a reasonably straight line.

The necessary skill may be acquired rather easily through practice. I have been told by reasonably reliable people that the job of capturing and developing an idea is slightly more difficult. I trust that these few more or less random but pertinent hints on the art of writing for publication will prove of material assistance to any person fortunate enough to read this frank and friendly explanation of the writing trade. In former days writers and molders, and presumably other young men engaged in less worthy occupations, served a long gruelling apprenticeship before they were considered competent to handle a job. For the past year or more, molders and other skilled operators have been popping out of the training course bushes after a brief period of incubation, or maybe a shot in the arm. It is only fair to assume that writers can be developed in the same miraculous modern manner.

Now that we have finished that detour and are once more back on the wide, open road, I shall dispose rapidly of the remaining items on the agenda: Maintaining amicable relations with Bill over a period of 30 or 40 years, and tapping him at regular intervals for expression of opinions. As I pointed out several paragraphs back, the period is only 25 years. I think the worthy brother is linking the *Adventures of Bill* with a series of articles which appeared in another publication several years before, written in the days when I carried a card from one town to another, and a trowel and double ender in my hip pocket.

Maintaining amicable relations with Bill never has presented any difficulty.

(*Concluded on page* 156)



The old Doc was a firm believer in the practice of pouring any kind of stuff fast and hot

MASSIVE LOADS TRAVEL ON *Overhead Railways!*

★ Removing wing section from jig with 5-ton carrier on multiple truck crane.

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THE problem of "up and over" movement of massive loads in the mammoth bomber plants now turning out Flying Fortresses and Liberators was solved by American MonoRail engineers.

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Nationally known architects who built these plants recognized early in their plans the advantage of calling upon American MonoRail engineers for highly specialized recommendations. This service is available in connection with war production now or for plant conversion in the future. Early consideration of handling problems often saves valuable time and needless building cost. Call your nearest American MonoRail representative or write us today.

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★

(*Concluded from page 154*)

I craftily stick to the old reliable formula which guarantees peace between two people united in marriage, business or any other form of partnership. I let him have his own way, or else we arrive at a compromise. If I feel like talking about fishing, or bird lore, the price of hay in Peru, or the volume of peruna consumed in the New England states in any one calendar year, and at the same time Bill wants to talk about bedding a job in the floor, why, we talk about bedding a job in the floor. So far as tapping him is concerned, the operation is not necessary. Bill is the greatest of all partners, a self starter. Usually my problem is not how to start him, but how to stop him.

Thus by short and easy stages we have arrived at the $64 question: How did Bill enter and become a permanent fixture in THE FOUNDRY?

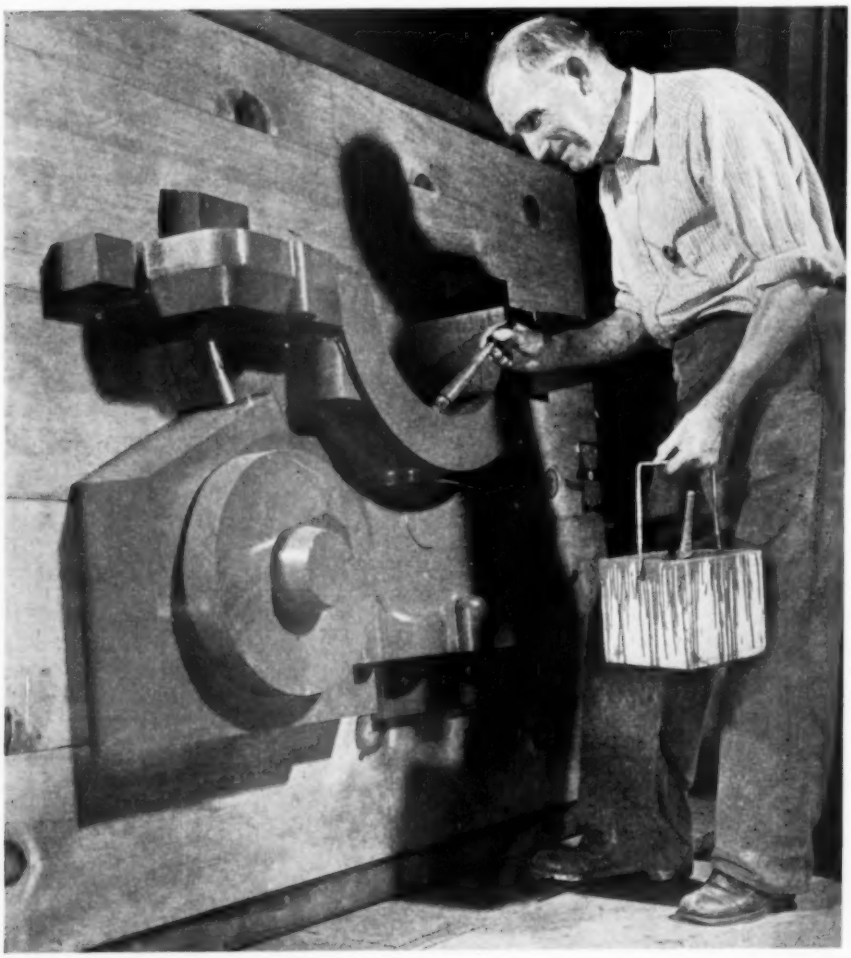
Well—to borrow one of Bill's favorite phrases—I'll tell you. In the Fall of the year '18 (present century *if* you please) while toiling diligently as No. 1 Boy in a Nova Scotia foundry I developed a case of the flu, short I believe for the longer title Spanish influenza. It very nearly made short work of me. Older readers will remember when this deadly epidemic swept across practically all of North America. I missed the swing of the Grim Reaper's scythe by a narrow cat hair. Comparing notes a few years later with my old friend John Hill, of Cincinnati, he told me he had a similar experience. He ascribed his complete recovery and subsequent perfect physical condition to a life long and frugal diet of fresh garden vegetables and copious drafts of pure, sparkling spring water. Well, I would not know about that. My doctor achieved the same result by spilling into me three times a day a horrible dose, apparently compounded from a triple essence of gall and wormwood, sulphuric acid and sheep dip.

With nothing to do during the convalescence period, my mind turned to a problem I often had heard debated but never solved by the boys in the foundry. How did the ancient Israelites mold and cast the immense columns for Solomon's temple. According to several references in the Old Testament each casting was 6 feet in diameter, 27 feet in length, a hands breadth or 4 inches thick, and approximate weight 40 tons. Contemplating the equipment and rigging required in the rather remote event the Chief should toss a similar job into my lap some day, I wondered more than ever how the old boys handled the job without crane, flask, arbor or furnace. Finally I hit upon a plan. I do not claim it was the plan invented and adopted by the old Semitic foundryman, but it very well might have been.

To while away some idle hours I wrote a description of how the castings probably were made in the clay ground in the valley of the Jordan. After reading it over, I decided it would have a better chance of being accepted for publication if I added a dash or two of human interest. Besides, in my natural modesty I shrank from the idea of coming out publicly under my own signature. The story would sound much better written in the third instead of the first person. I created Bill, a composite of several shrewd, kindly and highly expert foundrymen for whom I had worked at various times, men who had taught me the trade and men whom I still hold in grateful remembrance, master foundrymen. In the revised version of the story I submitted the column problem to Bill, and then retired modestly in the background, while Bill, like the redoubtable Subedar Prag Tewarri in Kipling's *Grave of the Hundred Head*, told how the work was done!

As the author, of course, I thought the thing was pretty good, but in my weakened condition I nearly had a relapse when the editor of THE FOUNDRY, the late A. O. Backert, wrote me a flattering letter of acceptance, a request for further material, and a little later an offer of a position on his staff.

Since this is a special occasion I submitted this manuscript to Bill before sending it to the printer. "Probably it will pass," he admitted, "but in my opinion it is too top-heavy. Fairly reeks with egotism. What about me and Harry Richey? Dash it all, I supply nearly all the dope for your stories, and Harry has made all the pictures to illustrate them from the very beginning. What do we get? Just a skimpy mention. Richey's cartoons are clipped and pinned up in foundry offices all over the world. Did you ever hear or read of any person who clipped and pinned up your stories? I've a good mind to draw me back time and quit. Then where would you be? Up Salt Creek without a paddle, me lad, and you can lay to that!"



THE FINAL TOUCH: Patterns at the plant of the Allis-Chalmers Mfg. Co., Milwaukee, are painted according to standards adopted by the A.F.A. and other associations. Unfinished surfaces, black; machined surfaces, red; seats for loose pieces, red stripes on a yellow background; core prints, yellow; stop-offs, diagonal black stripes on a yellow base

Plant Protection

A sound motion picture, entitled "If It Happened Here," which depicts the operation of a typical industrial plant protection organization has been completed by Bethlehem Steel Co. The 16 mm. film includes simulated incidents which would be expected to occur under emergency conditions. It is available without charge to industrial concerns for showing to personnel engaged in similar protection work.

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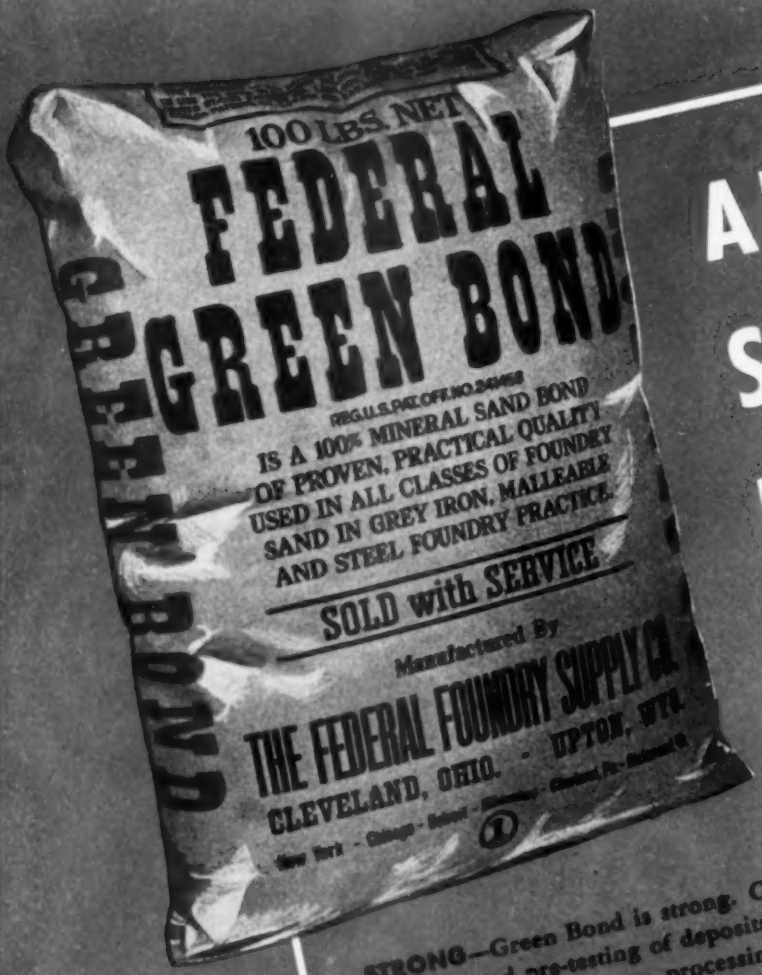
in '44...and afterward...



ALWAYS THE SAME GOOD BENTONITE

STRONG—Green Bond is strong. Careful selection and pre-testing of deposits—laboratory control of every processing step guarantees its strength when it reaches the foundry.

UNIFORM—You can establish your patch-mix with Green Bond permanently. Careful selection and processing by us ensure a constant, never-changing mix to you.

FAST—Green Bond is fast. It blends with sand so quickly that it's the ideal bentonite for use in today's high-speed mullers. Uniform grind makes it fast. For real speed, it's Federal Green Bond.

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LaGrand Industrial Supply Co., Portland, Ore. • Shanahan's Ltd., Vancouver, B. C.

PINHOLING in aluminum alloy castings in many instances may be eliminated through use of a dry flux which removes the absorbed gases. The flux usually consists of mixtures of two or more fluorides and chlorides of the metals sodium, potassium and lithium. A typical example of flux is one composed of two parts by weight of sodium chloride and one part of sodium fluoride. The flux must be dry. Procedure in using the flux is to heat the metal to 750 degrees Cent. (1380 degrees Fahr.) and add the flux equal to 0.5 per cent of the metal weight. Flux is spread evenly over top of the bath and then pushed under the surface by an iron skimmer until the flux rising to the surface again appears to be fused. The metal is stirred several times, and the dross skimmed off. Then the metal is cooled to pouring temperature.

• • •

AT a recent meeting L. E. Carr, technical director, British Ministry of Supply, Washington, and designer of the famous British Matilda tank, mentioned that the first application of armor steel castings was the wedge shaped nose of the hull for that tank in 1936. At present castings up to 12,000 pounds are being produced in large quantities. Advantages of castings are that the joints are almost entirely eliminated, corners can be contoured to deflect attack, cast steel possesses sound ballistic qualities, is splash proof against fine particles of metal from small arms ammunition, and has a low cost due to elimination of machining and drilling as required with riveted and welded hulls. Further, Mr. Carr stated that survival of the tank as a war weapon will rest on its ability to withstand punishment rather than high-speed performance, which implies increased hull thickness mainly provided by casting.

• • •

WESTINGHOUSE engineers have developed an experimental device which will determine the amount of unwanted oxygen and water vapor in heat treating atmospheres by the dewpoint method. While the device is not available commercially as yet, it employs a diode, electronic type tube open at both ends. The electron emitter and plate operate continually in a stream of hot furnace gas. As long as the gas is free of impurities, the electron current is constant, but when oxygen and water vapor are mixed with the gas some of the electrons are utilized in forming negative ions. That causes a measurable decrease in electron current, and provides a continuous indication of gas quality.

• • •

SPINNING molds revolving on a horizontal axis for the production of cast iron airplane brake drums is an electric motor problem. The molds start and stop approximately 640 times a day. Starting load on each motor is about six times the running load, and the motor is close enough to the molds that it operates at an average temperature of 200 degrees Fahr.

• • •

A low temperature heat treatment of the 7 to 12 per cent aluminum-magnesium alloy is claimed to increase the yield point considerably without decreasing the tensile strength. Procedure described in U. S. Patent No. 2,314,852 mentions heat treatment from 1 to 3 days at temperatures from 140 to 240 degrees Cent. (284 to 464 degrees Fahr.). The method is said to eliminate the necessity for solution heat treatment.

• • •

IN a prominent nonferrous foundry the crucibles are carried from furnace to mold on home made carriages where the ladle shank rests on two plungers mounted on spiral springs in upright cylinders. Before pouring commences the crucible is lifted forward and the shank is placed in hooks in front of the carriage. Thus the lip of the crucible may be placed close to the sprue opening. The supports also hold the crucible steady and relieve the operator of the weight. The device is mounted on four caster type wheels and with a full crucible easily and readily may be maneuvered into any desired position by one man.

• • •

A new, high-frequency, electronic flaw detector for production line detection of longitudinal cracks and seams in nonmagnetic metallic tubing has been developed by General Electric Co. The instrument is said to be capable of detecting and locating imperfections ½-inch long, 10 mils (0.01-inch) and one-third wall thickness in depth—even though they are on the inside of the tubing and do not appear on either surface. Instrument consists of a control unit comprising an electronic circuit, and coil boxes for different sizes of tubing from ¼ to 2 inches outside diameter.

• • •

IN a manganese steel foundry operating a production line for making tank treads, trouble was encountered after the line had been in operation for 3 to 4 hours. Difficulty was from stick-downs due to hot sand which reached a temperature around 100 degrees Fahr. However, it was found that a coating composed of 50 per cent kerosene and 50 per cent linseed oil and sprayed on the aluminum patterns from time to time eliminated the trouble.

• • •

ONE of the reasons that magnesium and its alloys are difficult to handle is their low heat content. It has been determined that if the heat content of magnesium is rated at 100 on a volume basis that the heat contents of aluminum, bronze and gray cast iron, are 170, 190, and 270 respectively at their pouring temperatures of 1400, 2100 and 2500 degrees Fahr. Also the molding sand and core sand, into which magnesium is poured do not remain at the elevated temperature very long. Hence, the cores and their binders must be such that they disintegrate at comparatively low temperature.

• • •

A silica wash used on permanent molds for centrifugal casting of steel is composed of 200 pounds of silica flour, 4 quarts of sulphite liquor, 8 gallons of bentonite paste and 30 gallons of water. The bentonite paste is made by mixing 14 quarts of bentonite in 30 gallons of water at 180 degrees Fahr.

• • •

IT is reported that the new system of amplidyne control for electric arc furnaces developed in 1942 and applied to some 20 furnaces, has resulted in increased production, reduced power consumption, increased lining life and reduced electrode consumption.

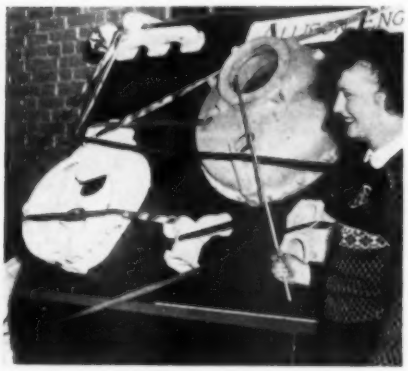
E. B.

Display of the Maytag Co. shows aircraft casting in as-cast and finished condition

OBSERVES ANNIVERSARY

With Wartime Castings Exhibit

THE MAYTAG CO., Newton, Ia., claimed to be the largest manufacturer in the world of domestic laundry equipment, celebrated its 50th anniversary Dec. 28, with a display of wartime castings a feature of the occasion. The evening program, sponsored by the Chamber of Commerce, the Junior Chamber of Commerce, the Rotary Club and Kiwanis Club, included a concert by band from First Woman's Army Corps Training Center, Fort Des Moines, Ia.; posting the colors; a tableau, *Maytag Through the Years;* presentation of plaque to Fred Maytag II; and an address by Lieut. Col. Charles W. Kerwood, U. S. Army Air Forces.



Use of aluminum castings for aircraft is explained by Miss Margaret Powell

The display viewed by thousands during the day included an Allison engine, a Packard-Rolls Royce engine, hydraulic actuating devices, and the hundreds of individual castings in the various assemblies. One board showed 136 parts of a hydraulic cylinder used at the beginning of the war, and in contrast the 69 parts of the Maytag design now in use. An interesting display featured the electrical assembly which operates the landing gears, wings and bomb bay doors of the Boeing B-17 Flying Fortress.

The Maytag company was started in 1893 with a workable idea, four able and ambitious men, a capital of $2400 and an abundant fund of confidence and enthusiasm. The company manufactured the first band cutter and self feeder for threshing machines. Later the line was expanded to a wide variety of agricultural implements. Manufacture of washing machines was started in 1907. The company pioneered the first swinging wringer, the first attached gas engine washer, the first all-aluminum tub and the first gyrator. Fred L. Maytag headed the company from 1895 to 1921. He was succeeded in turn by L. B. Maytag 1921 to 1926, E. H. Maytag 1926 to 1940 and the present incumbent Fred Maytag II who was elected president in 1940. Other officers of the company include: George M. Umbreit, executive vice president and treasurer; Roy A. Bradt, vice president; A. H. Taylor, vice president in charge of manufacturing; Will I. Sparks, secretary, and E. L. Nelson, assistant secretary.

Wisconsin Group To Hold Conference

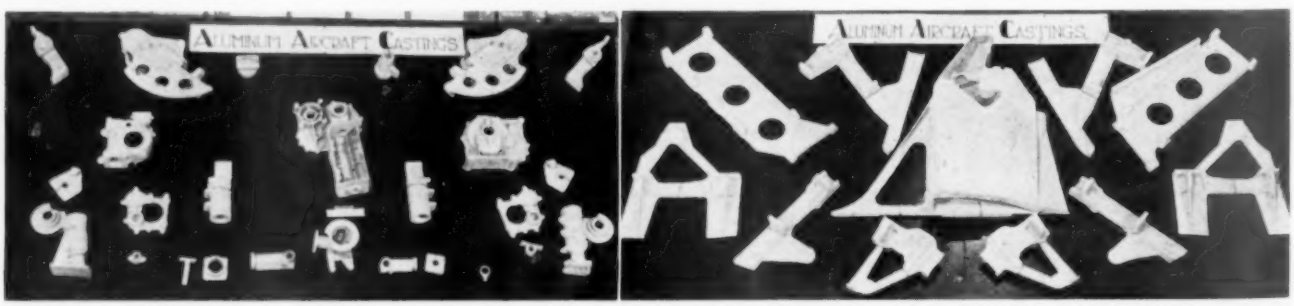
The seventh Annual Foundry Conference of the Wisconsin Chapter of the A.F.A. will be held Feb. 10 and 11 in the Hotel Schroeder, Milwaukee. Problems relating to present and postwar operations of various branches of the foundry industry will be discussed by leading speakers during numerous technical sessions scheduled for the two days. Harry Ladwig and William Hambley, Allis-Chalmers Mfg. Co., Milwaukee, are chairman and co-chairman, respectively, of the committee in charge of the conference.

A noon luncheon session on Feb. 10 will open the program, and will have for its speakers F. E. Johnson, dean of the college of engineering, University of Wisconsin, and Dean Holt. The latter will speak on the subject of "The University's Function in Training Men for Industry."

Following the keynote address, five different sectional divisions—gray iron, steel, nonferrous, malleable, and pattern-making—will start their opening meetings in discussion of such subjects as heat treatments, centrifugal castings, core blowing, etc. A new division created for this conference—management and engineering—will deal with special problems such as cancellation of government contracts, safety and health, etc.. Its opening session will be addressed by Dr. Paul Brehm, supervisor of the Wisconsin state board of health, who will talk on "Health in Industry from the Management Viewpoint."

Dr. Clarence Dykstra, president of the University of Wisconsin, will speak at the annual banquet the evening of Feb. 10. Dr. Dykstra formerly was city manager of Cincinnati, and was the first director of the Selective Service System. John H. Van Deventer, president and editor of *The Iron Age*, will speak at the noon luncheon of the conference on Feb. 11.

A total of 30 technical sessions will be held under the leadership of Chairman Ladwig, Co-chairman Hambley and the direct assistance of George K. Dreher, president of the Wisconsin Chapter, Prof. R. E. Shorey of the University of Wisconsin, John Bing, Dave Zuege, Frank Waldenmeyer, Charles Fuerst, B. D. Claffey, E. B. Hansen, George Smitka and C. W. Morisettee.



Various castings for fighter plane engines exhibited at fiftieth anniversary celebration of the Maytag Co.

Here's Where We Put the Squeeze on the *Axis*

● Every hydraulic press at Sterling is working overtime these days, creating from carefully selected bonds and abrasive grains the many sizes and shapes of the "Wheels of Industry" needed to speed materials of war from hundreds of foundries working today and everyday for victory.

We, at Sterling, work with the fullest realization that grinding wheels are important if planes, tanks, guns, and ships are to be turned out in quantity and on time.

The use of the correct grinding wheel often helps meet tough production schedules. Unusual jobs or new alloys often require new wheels. Finding the correct Sterling Grinding Wheel to do your difficult casting job better and faster is the job of the Sterling engineer in your territory who will gladly call at your request. Often, after a consultation and use of recommended wheels, production has jumped 25% and better! May we see if this is possible in your foundry . . no obligation naturally!

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OF THE CLEVELAND QUARRIES COMPANY
TIFFIN, OHIO

THE WHEELS OF INDUSTRY

ALUMINUM LABORATORIES

Observes 25th Anniversary

Checking soundness of cast aluminum cylinder head by x-ray examination at Aluminum Research Laboratories

ALUMINUM CO. OF AMERICA was host to hundreds of invited guests at a celebration on Dec. 16 in observance of the twenty-fifth anniversary of the Aluminum Research Laboratories. An inspection of the laboratories at New Kensington, Pa., was followed in the evening by a dinner at the University Club in Pittsburgh.

Officials disclosed that research investigation has resulted in the development of a new process with which it is now feasible to extract as high a percentage of the aluminum contained in the lower grades of bauxite as was formerly obtained from high-grade bauxite. Prior to the war, all of the alumina produced in this country was obtained by the Bayer process. In this process, about 1 pound of alumina and 1 pound of soda are lost in the red mud residue with every pound of silica contained in the original bauxite. This made it uneconomical to process bauxites high in silica. The new process takes the red mud residue of the Bayer process and after adjusting its composition, puts the residue through a sintering process. From the sinter, both alumina and soda formerly lost are recovered economically.

The practical result of this development is that substantial tonnages of bauxite hitherto disregarded as a source of alumina can now be made available to the war effort. In addition, the new process permits the conservation of the relatively limited domestic deposits of high-grade aluminum containing ores.

S. K. Colby, vice president, Aluminum Co. of America, presided as toastmaster at the anniversary dinner. Roy A. Hunt, president of the company, presented a pin to Dr. Francis C. Frary, director of research, in honor of his 25 years of service in research for Alcoa. In response, Dr. Frary reviewed the achievements of the Aluminum Research Laboratories during the past quarter-century in the development of production practices and aluminum alloys. This research work, he said, has permitted the company to be definitely ahead of its foreign competitors in developing the improved forms of the strong alloys which have come into general use during the past 25 years.

Dr. E. R. Weidlein, director of Mellon Institute, Pittsburgh, in speaking on "Research in Defense and Recovery," cited certain achievements of Alcoa in emphasizing the importance of the contributions of industrial research to the war effort. Dr. Webster N. Jones, director, College of Engineering, Carnegie Institute of Technology, Pittsburgh, discussed "University Research Tomorrow." He stated that universities must receive greater financial support for research programs, and that a new source of assistance must be found inasmuch as changed conditions and higher taxes make the endowment of schools by individual philanthropists nearly an impossibility. The new source must be industry, since from such support industry is enabled to maintain its technical personnel, he added.

Aluminum Co. of America established its central research organization in 1918, and on Dec. 16 of that year Dr. Frary, just released from the Chemical Warfare Service, was selected as its head and started to assemble the research group which was to become the staff of Aluminum Research Laboratories. The group originally was housed in a part of a building in the New Kensington Works of Alcoa. In 1930, Dr. Frary and his staff occupied a new, modern laboratory and office building situated on a 14-acre plot overlooking the Allegheny river. In addition, smaller specialized branches are located in Cleveland and East St. Louis, Ill. A complete experimental foundry is part of the Laboratories' extensive research equipment.

Birmingham Chapter Plans Conference

The twelfth annual foundry practice conference of the Birmingham District Chapter of the American Foundrymen's Association will be held in Birmingham Feb. 18. The program for the one-day conference includes plant visitations in the morning, followed by two technical sessions in the afternoon and an evening dinner meeting.

A number of interesting papers are scheduled for presentation at the afternoon gatherings. Lee C. Wilson, president of the A.F.A., will be guest of honor at the dinner.

MAGNESIUM and ALUMINUM CASTINGS demand these 5 features of the modern

ROSS CORE OVENS

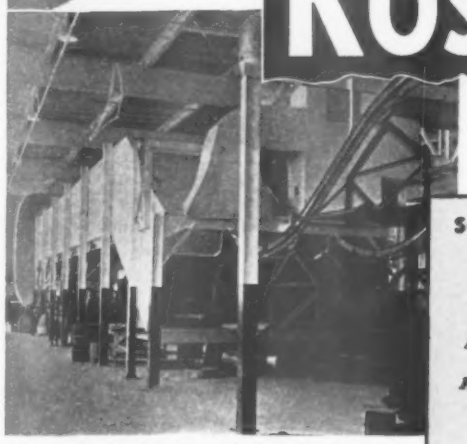
1 UNIFORM TEMPERATURES: Large quantities of circulated air insure uniform distribution of heat at low temperature differences.

2 AIR DISTRIBUTION: Use of special nozzles increases air flow and turbulence, prevents stratification and insures uniformity throughout full oven.

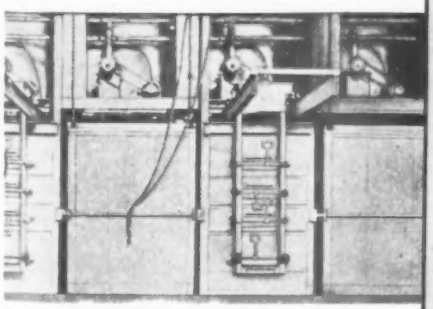
3 MAXIMUM CAPACITY: Temperature limits are small enough for proper baking of all sizes of cores on every shelf.

4 CONTROLLED TEMPERATURE CURVE IN OVEN: Temperature is controlled in zones in conveyor ovens.

5 PANEL CONSTRUCTION: Insulated Steel Panels provide the advantages of—minimum through metal, quick assembly and minimum heat loss.



Continuous Core Drying Oven for Sprayed Cores.



Ross Multiple Compartment Stationary Oven

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STATIONARY CONTINUOUS CONVEYOR

The shift from iron to the new light weight metals has brought new problems in core baking. Radical differences in properties of the light metals require more exacting control and present new problems in the preparation of the cores. ROSS Core Ovens have solved these problems through their ability to insure utmost uniformity and control of temperatures and air distribution. Their design embodies 25 years experience in the handling and control of air for processing.

Our engineering department will gladly supply full details on request. Write us.

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CONTROL OF AIR FOR MODERN INDUSTRY

WASHINGTON NOTES ★ ★ ★ ★

WITHOUT knowing how the United Nations will fare on European battlefronts this year it is almost impossible to determine exactly what additional shifts and cutbacks in war production will be advisable in coming months. Should large-scale landings in Europe be repulsed, production of certain war materials, now curtailed or terminated, would have to be resumed or increased sharply. For this reason, standby facilities are being retained in most cases of cutbacks.

★ ★ ★

As things now stand, chief cutbacks planned for coming months will be in small arms and ammunition, tanks, certain types of anti-aircraft equipment, non-combat aircraft, and artillery fire-control equipment. More than offsetting this will be an almost doubled production of combat aircraft, with greatly increased emphasis on bombers; tripled requirements for high-octane gasoline; an estimated 1,000,000 deadweight ton expansion in merchant shipping; a 50 per cent increase in trucks; and more electronic equipment, heavy guns, heavy artillery shells, ground ordnance and signal items.

★ ★ ★

TO SOME people the proposed 17 per cent increase in the 1944 over-all program of war production compared with 1943 seems at variance with the slowing down or closing of certain ordnance plants, the cut to a 6-day week in shipyards, the curtailment in production of some raw materials, etc. One fact sometimes lost sight of is that the planned upturn for 1944 is figured against the 1943 total, and since last year's production trend was upward, little change from the November-December pace would be necessary to reach the projected goal.

★ ★ ★

Moreover, many producers whose contracts were terminated or reduced have switched to new products—for example, from tanks to locomotives or from escort vessels to landing craft. Despite the dropping of the regular Sunday shift at shipyards, the Maritime Commission's program calls for a small increase in merchant shipbuilding. There has been large and consistent absenteeism on Sundays, and with seven full work days, repair and maintenance of equipment was difficult. Closing the ways on Sundays eliminates both troubles. The 6-day week provides the same number of man-hours as the 7-day week, and workers formerly on Sunday shifts now get in their time on week days.

★ ★ ★

THE NAVY is taking no chance on the possibility of an early cessation of hostilities. It has projected plans for plane production into 1945 and for its shipbuilding program through 1947. The shipbuilding program calls for completion in 1945-47 of more than 500 combat ships, about 400 patrol and mine craft, more than 600 auxiliary vessels and more than 70,000 landing craft.

★ ★ ★

Incidentally, the announced cutbacks by the Navy during the second half of 1943 amounting to $2,856,000,000 were largely paper transactions because, with some exceptions, fabrication had not actually started. Materiel eliminated was to have been produced during 1943-46.

★ ★ ★

OFFICIALS of WPB are taking pains to make it clear that there will be no resumption of civilian goods manufacture except that which can be accomplished without the slightest interference with the war effort. This means that merely the availability of sufficient metals to permit lifting of curbs on the making of certain peacetime goods will not be the deciding factor—particularly so long as there is a manpower shortage among war plants.

★ ★ ★

At the same time, steps will be taken to maintain the civilian economy because of its indirect influence on war production. Examples of this are the authorization for manufacture of 2,000,000 electric irons and 50,000 gray iron bathtubs. Some electric refrigerators and stoves for war housing may be scheduled this year—provided the metal situation continues to ease, and manufacturing facilities become available through further cutbacks occasioned by favorable war developments.

★ ★ ★

MEANWHILE, revocation of additional bans against use of different metals in manufacture of permitted items probably will appear from time to time in response to the better supply situation. For instance, certain furnace parts—including feed door smoke curtains and inner liners, hot blast lift doors and shaker handles—now may be made of gray iron castings. Formerly no metal could be used. Chromium and nickel again may be used in automotive valves. Use of copper and brass in electric fuses and wiring devices, lubricating equipment and new motor trucks no longer is banned.

★ ★ ★

On the other hand, the tight position of malleable castings is reflected in certain recent WPB orders. Malleable handbrake wheels for freight cars now may be obtained only for maintenance and repair for rolling stock and no longer may be used in converting from the old non-geared type of brake to the modern geared type. The malleable shortage also is responsible for permitting the use of manganese steel in conveyor and chemical power transmission chains and sprockets.

★ ★ ★

AS A consequence of the increased supplies of cobalt, molybdenum, tungsten and vanadium, restrictions on the delivery and sales of these alloying materials have been lifted. WPB still will have a check on distribution through regular reports by vendors covering their larger sales.

★ ★ ★

As previously reported, pig iron is removed from allocation this month. However, WPB retains the power to issue specific directions with respect to production and delivery, in order to take care of individual critical cases. In addition, producers are required to file simplified monthly reports on production, shipments and inventory which will enable WPB to determine whether requirements are being met.

★ ★ ★

TO FACILITATE the flow of cast iron scrap to foundries having no facilities for preparing the material for charging, OPA has ruled that scrap dealers no longer will be required to absorb inbound rail transportation charges on heavy breakable cast which has been allocated or which they have purchased in behalf of a foundry. The dealer now may pass on to the buyer the rail charge accrued in moving the scrap from origin point to his yard for preparation.

★ ★ ★

Ceiling prices on aluminum scrap and secondary aluminum ingot at the producer level generally have been reduced 1½ cents a pound by OPA. The new base price for secondary ingot is 12½ cents a pound, or approximately the market price prevailing at the time the ceiling was lowered. One exception to the reduction in secondary ingot is on "primary grade ingot." This grade has been cut only ½-cent, since it is made partly from primary metal.

★ ★ ★

COKE PRICES continue to advance in reflection of higher coal and labor costs. Producers' ceiling on by-product foundry coke produced in various Midwestern and Southern states have been increased 30 cents a ton. The advance applies in Alabama, Illinois, Indiana, Iowa, Kentucky, Michigan, Minnesota, Missouri, Tennessee, Wisconsin, and Ohio west of Cleveland.

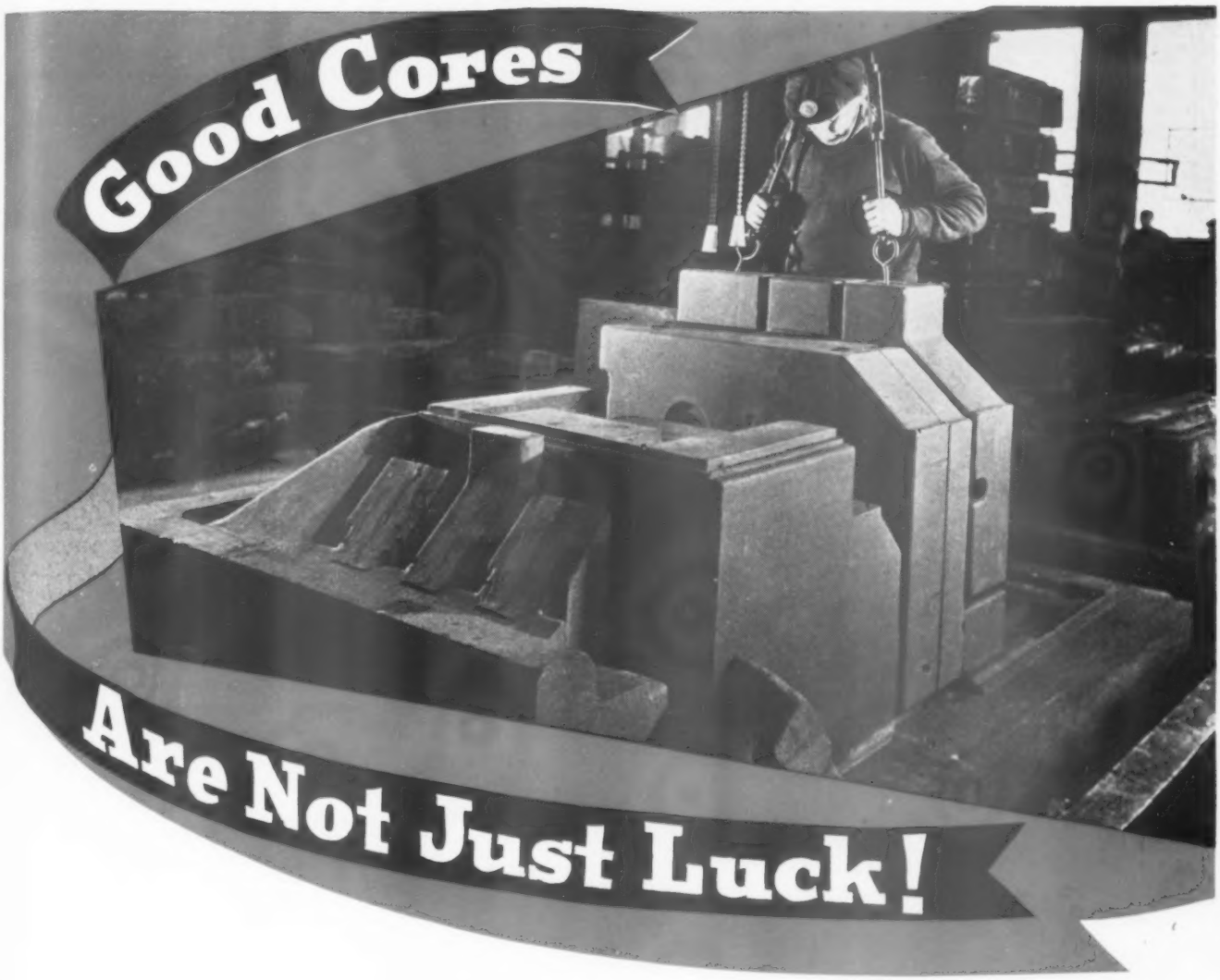
★ ★ ★

Beehive coke likewise has been affected pricewise. Coke produced in hand-drawn ovens now has a $7.75 ceiling, f.o.b. Connellsville, Pa., an increase of 75 cents, while machine-drawn coke is up 50 cents to $7 a net ton. Both increases are effective as of Nov. 29, when higher bituminous coal ceiling prices were authorized by OPA.

★ ★ ★

TO PROTECT the aluminum supply from contamination, WPB has restricted the flow of certain high-zinc alloy aluminum scrap. Such alloy scrap now may be sold only to dealers, to the Aluminum Co. of America, or to the National Smelting Co.

(*Concluded on page 166*)



This built-up core for an essential wartime machine tool casting was made in one of the foundries of the American Brake Shoe Company, using Certified core oil as the binder.

For large and intricate core jobs, as well as the general run of cores, Certified core oils are preferred in many foundries because the price is right and the oil, which has every desirable quality, never varies in quality.

No matter what the nature of the cores or the kind of sand used, there is a *prescribed* Certified core oil which will produce cores of the desired strength at less cost, work smoothly in the core boxes, dry quickly in the oven, reduce gas during pouring and provide remarkably easy shake-out.

A trial of *mixed-by-weight* Certified core oil will prove profitable for you. Tell us the core oil and sand used, your oil-to-sand ratio, what other binder is used (if any), the oven heat employed and a description of the castings produced.

Let "Scotty" Waugh, the Core Oil Doctor, furnish a core oil prescription that will lower your core costs and end your core oil troubles.

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READERS' COMMENT . . .

Melting Bronze

TO THE EDITORS:

We have read with interest your question and answer headed "Wants To Use Cupola To Melt Bronze" on page 122 of the December issue of THE FOUNDRY.

It is our opinion that you very ably described the procedure of melting bronze in a cupola, considering that your inquiry came from a plant having only a cupola available to supplement their crucible furnace capacity for melting bronze. While your reply definitely states that cupolas have been used for copper base alloys, it is our understanding they can best be used only for very high copper content alloys, such as bearing metals, on account of the high loss of the low melting points constituents such as zinc.

The loss of one or more charges of metal would go a long way toward the purchase of an additional crucible furnace for increased melting capacity.

Your reply might leave the impression with the reader that the use of a cupola is an equally satisfactory method of melting bronze. It might, therefore, have been in order if the reply had also mentioned the alternative of increased crucible furnace capacity.

E. J. GEITTMANN

Fisher Furnace Co.
5535 North Wolcott Avenue
Chicago

More About Pipes

DEAR PAT:

Now do you know I am hardly able to dictate this letter on account of a bad pain in my side for which I can thank Pat Dwyer. I read your article *The Adventures of Bill* last night and I am not the better of it today. You used two words, adiabatic and isothermal in connection with the draft. You have broken the ice for me because in my talk on compressed air I have avoided the use of these two words on the supposition that I might be talking over the heads of the audience. Either word is not particularly instructive in a talk on compressed air, but you surely run it in good shape in your article.

What capped the climax on my risibilities was your portrayal of the guy with the bent figure S pipe. A man smoking one of these things always reminds me of one of Chic Sales' early and primitive models. I wondered why you did not go a step further and quote some of Larry Hogen's doggerel in his short, short stories on smoking as told to the Widow Rooney. The concluding stanza runs:

A pipe it larns us all this thing
Tis fair without and foul within
Just like a sowl begrimed with sin
Think of this when you're smoking
Tiba-akky!

I trust you will live many more years and keep on producing your highly instructive and very humorous monthly articles. Believe me, foundrymen in these times have so much trouble, particularly labor troubles, they are in need of something to humor them up, at least once a month.

JAMES A. MURPHY

Hamilton, O.

Standard Brass Is Fifty Years Old

Standard Brass Works, 1816 West St. Paul Ave., Milwaukee, celebrated the fiftieth anniversary of the founding of the company on Jan. 17. Just a half century ago on that day Fred Warner and Arthur Schenck poured the first heat of brass. Since that time the company has grown steadily and now is busier than at any time in its history in the production of parts for bombers, guns and other materials of war. One of the interesting factors in connection with this organization is the success of the management in quadrupling production without increasing the floor space of the plant.

ROY M. JACOBS

Standard Brass Works soon outgrew the alley building in which the first casting was produced, and moved to St. Paul avenue in 1902, just 2 years after Kenneth W. Jacobs became president of the organization. He remained head of the organization until 1925 and since that time the business has been continued under the direction of his son, Roy M. Jacobs, as president. Adolph H. Schott is vice president and plant manager, Burleigh Jacobs, secretary, Viola L. Schmidt, treasurer, and Kenneth W. Jacobs Jr., director.

Specification Revised

Recent amendment to Federal Specification QQ-B-691a for Bronze Castings contains a number of changes. They include addition of two alloys to the old list making 12 instead of 10, and several changes in composition of the alloys. Copies of Amendment 3 may be obtained from the Superintendent of Documents, Washington, for 5 cents.

Washington Notes

(*Concluded from page 164*)

Restrictions on acquisition of graphite crucibles have been lifted as a result of the better supply. Inventory control has been substituted for the former limitation on purchases.

★ ★ ★

FREIGHT CAR building will be brisk this year. Total production will be approximately 50,000 cars, or considerably more than any one year's output in the decade prior to Pearl Harbor. About 30,000 cars of the total will be the all-steel type, a change from the previous composite type because of the lumber shortage and the increased supply of steel.

★ ★ ★

Production of wheeled tractors also is expanding, December output of more than 20,000 units being the largest for any month in two years. A year ago only 4200 tractors were built. Quota for the 12 months ending next June 30 is 209,000, compared with 122,000 in all of 1943. Landing craft use certain components also needed for tractors, a factor which may retard the latter's program.

★ ★ ★

A SLIGHT improvement in the labor situation is developing, but the betterment is spotty. The number of areas in which labor shortages are acute has declined from 69 as of Dec. 1 to 67, and the number of areas where shortages are expected to develop within 6 months has dropped from 124 to 119. In ten additional areas a slight labor surplus is expected to prevail after 6 months.

★ ★ ★

One contribution to a better labor supply has been the decline in construction. From the wartime peak of 2,190,000 men employed in the building field in the fall of 1942, the number has fallen to about 600,000 to 700,000 at present and is expected to drop another 100,000 by mid-year. The 1944 construction program will be only one-third that of 1942, reflecting the completion of the major share of work on war production facilities and those required by the armed services.

W. G. G.

Production of Steel Castings Rises

Production of commercial steel castings in October totaled 163,888 tons, according to a report of the United States Department of Commerce, Bureau of Census. This compares with production of 157,818 tons in September and 152,080 tons in October, 1942. Orders for October totaled 211,341 tons, slightly under the 214,086 tons in September but considerably above the 179,537 tons in October a year ago. According to the department, the industry operated at 81.2 per cent of capacity in October.

Clark Tructractor Division, Clark Equipment Co., Battle Creek, Mich., has received the Army-Navy white star, symbolizing renewal of the "E" production award conferred last spring.

"MASTER" CHISELS

FOR PNEUMATIC TOOLS

The Answer to Many a Foundryman's Question—

FOUNDRYMEN everywhere have been telling us that "Master" Pneumatic Hammers and Sand Rammers provide plenty of power and then ask—"Why don't you give us a chisel that will take what your tools will dish out?"

Here it is—a line of "Master" Chisels made from the finest chisel steel and precisely heat-treated to develop the utmost in wearability. And don't forget, the more wear you get out of a chisel, the less it costs.

"Master" Chisels are available in all the styles called for in foundry service—round or hex shanks—5/8, 3/4 and 7/8 inch—and in chisel blanks.

IMMEDIATE SHIPMENT FROM STOCK.
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HEADQUARTERS *for Tool Rebuilding*

Pneumatic tools of any make rebuilt by the "MASTER" Method with cylinders HARD CHROME PLATED to resist wear longer than the original cylinder.

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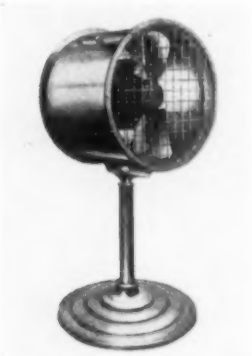
Rebuilders of all makes of Pneumatic Tools

Cooling Fan

Chelsea Fan & Blower Co. Inc., 1206 Grove Street, Irvington, N. J., announces a new cooling fan, known as the Air Blaster, which delivers a large volume of air in a straight line with only a slight expansion in cross-sectional area of the discharge. It is said to be especially effective in reaching out-of-the-way corners and dead air spaces. The unit consists of a welded steel housing, mounted



on an adjustable pedestal which may be tilted 60 degrees up and down, and made in three sizes: 18 inches, ¾-horsepower, 6000 cubic feet per minute motor; 24 inches, 1½-horsepower, 9000 cubic feet per minute motor; 30 inches, 1½-horsepower, 11,000 cubic feet per minute motor.

Core, Facing Binder

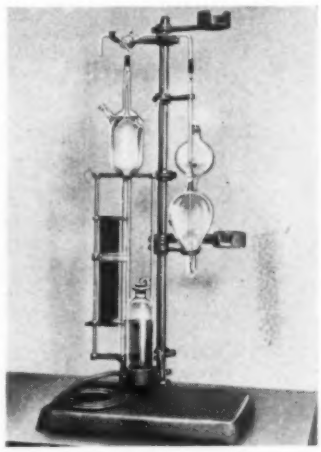
Bondite Corp., 2325 East Thirty-eighth Street, Los Angeles, and 844 150th Street, Hammond, Ind., has developed a basic hydrocarbon core and facing binder for steel, iron and brass foundry use. It is said to permit use of finer sands, because of its waterprofing qualities and increased permeability; also to work well in old sands, producing smooth castings which reduce cleaning costs, and requiring only skin drying of molds. Cores are claimed to bake rapidly and stand higher temperatures without burning. Volatiles and gases produced upon contact with hot metal are said to be nonreactive, with an absence of fusing of the sand.

Ferroalloy Briquets

Ohio Ferro-Alloy Corp., Canton, O., has developed and introduced a new line of ferroalloy briquets which use pitch as the binding agent. Selection of the binder has resulted from an extensive study on the part of that organization. Pitch binders have been known for a long time and have been used successfully for many purposes. However, it was the general belief that under heat, pitch binders would melt away, causing the briquets to crumble and expose the readily oxidizable ferroalloys to losses. Tests showed an entirely opposite result. The pitch used to bind these briquets carbonizes readily, the small amount of volatile matter is given up, and the ferroalloys are bound with a carbon residue that protects the alloying agent. The Ohio Ferro-Alloy Corp. states that its briquets are made from ferroalloys of known analysis which are crushed to the correct sizes to give a briquet of maximum density, accurate weight and correct analysis when mixed thoroughly with the special pitch binding agent.

Carbon Determinator

Harry W. Dietert Co., 9330 Roselawn Avenue, Detroit 4, announces an improved two-minute carbon determinator for rapid and accurate measurement of total carbon of all metals. Gas pressure in both the measuring burette and carbon dioxide absorption vessel automatically is brought to the same atmospheric pressure, thereby eliminating possible error in reading due to difference in gas pressure at the start and end of the test. Gas pressure in the measuring burette is brought precisely to atmospheric pressure when the reading is taken by having the burette connected to a U-shaped absorption vessel. Liquid level in the vessel is brought to a fixed hair line marker on a capillary tube stem of this vessel. The marker is set at atmospheric pressure level, and eliminates the error usually obtained in leveling by eye between the aspirator bottle and burette stem. The



sample is burned in the combustion tube in a partial vacuum which aids in complete combustion of the sample. An improved support gives maximum protection to the glass parts.

Burner Control

Combustion Control Corp., 77 Broadway, Cambridge 42, Mass., announces a photoelectric system for providing instantaneous fuel cut-off in any pressure-fed burner in the event of flame failure. Capable of monitoring flame of any intensity, the system is applicable to oil, gas, or pulverized coal burners, and operates entirely from direct observation by a photocell of the flame itself rather than wholly or partly from such secondary characteristics as temperature or electrical conductivity. Being actuated entirely by the presence or absence of

flame, the system operates immediately and eliminates the explosion hazard present when even a few seconds elapse before fuel cut-off.

Skin Protector

Cadet Creme Co., 151 Farrar Avenue, Worcester, Mass., is furnishing a cream for applications to hands, face or other skin areas as protection against certain acids, alkalis and caustics. The film formed is said to prevent skin absorption of most types of non-water carrying materials and irritants. It may be removed without difficulty by application of water and rubbing until a lather forms.

Drum Opening Tool

Merrill Bros., 36 Caspian Street, Brooklyn, N. Y., is offering a drum opening tool patterned after the old-fashioned household can opener. It cuts as it grips the outside of the barrel and folds the cut edges in close to the barrel. The tool is made of drop forged steel, and the hardened cutting edge of the drum opener can be resharpened when necessary.

Back-Stand Idler

Porter-Cable Machine Co., Syracuse 8, N. Y., announces a new back-stand idler used to adapt grinding and polishing lathes to abrasive belt grinding. By use of a long belt greater heat dissipation is obtained than in the case of a wheel, this preventing discoloring or burning of the piece being ground. Any width belt up to 6 inches can be used. The idler is equipped with a hydraulic safety device which prevents the belt tension weight from exerting too great a pressure on the belt when starting up the machine.

Unit Dust Collector

Leiman Bros. Inc., 167 Christie Street, Newark 5, N. J., has developed a compact unit dust collector which provides ample space for application of the cyclone type dust collection operating principle. It draws dust away from point of origin as well as separates the dust and returns cleaned air to working space. Capacity is sufficient to handle exhaust from two grinding wheels or buffs, saw, belt sander or similar machine.

Fluid Cooler

Gray-Mills Co., 213 West Ontario Street, Chicago, has added a new industrial fluid refrigerating system to its line of self-contained portable coolant equipment. This model mechanically refrig-

MARSCHKE

NEW! Vari-Speed Grinder

The Biggest and Best of the Kind!

★ 40 HP. Motor!

★ 30″ Wheels!

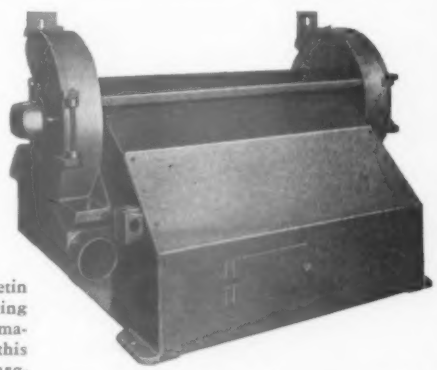
This NEW MARSCHKE has what you need to cut snagging costs—WHEEL CAPACITY, 24″ or 30″ x 4″—POWER, 25 to 40 HP. at normal rating with 100% overload capacity—VARI-SPEED DRIVE with automatic control to maintain constant wheel rim speed—and BACKBONE to stand up under severest grinding conditions.

This NEW MARSCHKE VARI-SPEED combines dependability of accurate wheel speed control with mass, rigidity and power to get maximum metal removal at minimum wheel cost.

The NEW MARSCHKE appeals to piece-work operators because it increases earnings, and to management because its greater production and wheel economy reduce snagging costs.

★

The Marschke Line includes Floor Stand, Pedestal Type and Swing Frame Grinders and Buffers in over 70 standard specifications for AC and DC power with motor sizes ranging from 1 to 40 HP. and with 10″ to 30″ wheels.

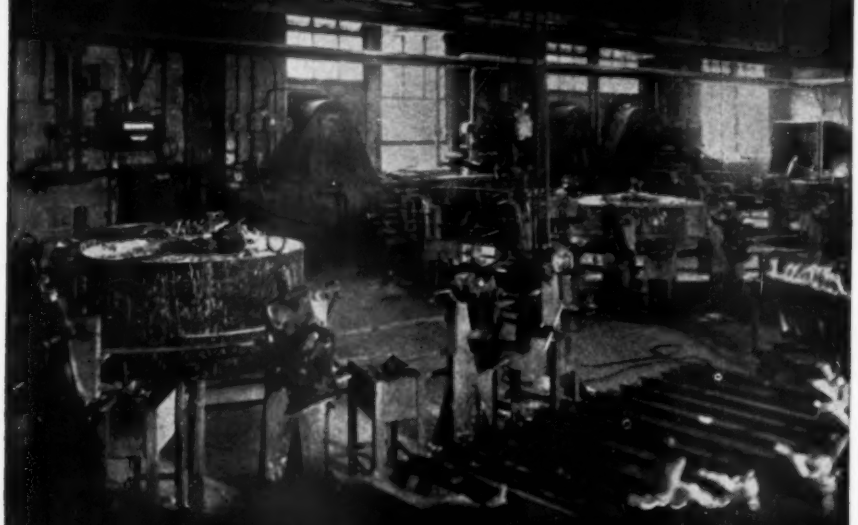


MARSCHKE QUALITY GRINDERS AND BUFFERS

Send for Bulletin No. 51 giving detailed information about this newest and largest Marschke Floor Stand Snagger to Vonnegut Moulder Corporation, 1839 Madison Ave., Indianapolis 2, Ind.

★ VONNEGUT MOULDER CORP. INDIANAPOLIS

HAUSFELD
FURNACES



MAGNESIUM
DIE-CASTING

Battery of
HAUSFELD
600 lb.
Magnesium
Furnaces in
Die Casting Plant

Photos courtesy of
ARMSTRONG CORK CO.
Lancaster, Pa.

The Campbell-Hausfeld Co.
300-320 MOORE ST. HARRISON, OHIO

erates fluids, settles and screens out chips and coarser abrasives, and applies the coolant or fluid to the work by means of a self-contained pump. It is adaptable to the cooling and temperature maintenance of many industrial fluids, with special emphasis on coolants for metal cutting, hydraulic oil applications, maintenance of submerged bearing temperatures, quenching oils, spot welders, and laboratory setups. The unit is portable, requires no water connection, and to operate is merely plugged into the power line. The cooling tank, equipped with settling and filtering screens, has a capacity of 35 gallons. Screens are available in various meshes and with baffle plates, remove chips and coarser abrasives.

Magnesium Welding

Eutectic Welding Alloys Co., 40 Worth Street, New York, has developed a special alloy and flux for filling and adding metal to magnesium castings and parts which are broken, cracked, porous, and for joining magnesium sheets to castings,

correcting machining errors, etc. The rod diameter is 3/16-inch, and the flux is a white powder. Binding temperature of the rods ranges from 960 to 1060 degrees Fahr. Previous to welding, the castings should be preheated to 700 degrees. Color of the welds is said to match closely the parent metal, and the strength, hardness, and corrosion resistance of welds is claimed comparable to the parent metal. The welding alloy contains a high amount of magnesium with aluminum.

Window Glass Cleaner

Berman Chemical Co., Toledo 2, has developed a chemical compound for dissolving light-obstructing film from window glass. Tests made of the compound on greenhouse glass are said to show that its use increases light admission by 30 to 60 per cent.

Plastic Mallets

Greene, Tweed & Co., 4377 Bronx Boulevard, New York 66, announce new plastic mallets, as well as plastic faces for their replaceable face hammers. Both are recommended as a substitute for the now difficult to obtain rawhide. Dimensions and weights are the same as raw-

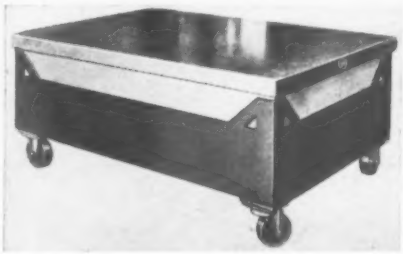
hide, and the plastic faces and mallets may be used where rawhide has been used. The plastic has been selected for qualities of toughness and resilience, and is said not to chip, split or "mushroom," nor mar the surface on which the mallet is used.

Coating for Hands

Jones Medical Laboratories Inc., 800 Huron Road, Cleveland, is offering a new protective coating for the hands of workers exposed to oil, grease, various chemicals, etc. Known as Neo-Film, it is a liquid applied by the user before work. It is said to dry quickly and to be removed easily with soap and water.

Surface Plate

Herman Stone Co., 1238 Leonhard Street, Dayton 4, O., is offering precision surface plates made of extremely hard natural granite. Being harder than the hardest tools, as well as rust-proof and



warp-proof, they are said to be practically indestructible. Four standard sizes, ranging from 12 x 18 inches to 24 x 36 inches, are held to an accuracy of 0.0001-inch. Special sizes, like the 4 x 6-foot size illustrated, are finished to an accuracy of 0.0003-inch. Working surfaces are processed while supported on a three-point bearing, which remains on the plate permanently. The surface is claimed to be treated so as to be non-abrasive.

Welding Spotlight

General Electric Co., Schenectady, N. Y., announces a new spotlight designed to provide glareless illumination of sufficient intensity for an arc welding operator to see his work distinctly through the dark lens of a welding helmet prior to striking the arc. Mounted on an upright telescoping metal standard and set firmly in an 18½-inch diameter, 30-pound cast iron base for stability, the spotlight consists of three 300-watt reflector spot lamps surrounded by a circular shade. The lamps are mounted in adjustable porcelain holders, which permit the area covered by the light beam to be increased from 7 inches in diameter to a clover-

DUST CONTROL

A MIGHTY FORCE IN WAR PRODUCTION

• Dust Control *is* "a mighty force in war production,"—a silent partner to the mammoth machines, roaring furnaces, striving men and women. Behind the scenes in thousands of war plants and arsenals, that intrepid guardian —Dust Control—is doing a man-size job in keeping the ravages of industrial dust, soot and grime from vital machines, materials and workers.

• Such an important job as this must be complete. There is no room for partial Dust Control—for a job half done. That is too costly to meet the demands of modern industrial progress.

• Pangborn Dust Control, the result of forty years experience and research in answering industry's needs, will assure complete and exacting coverage for *your* dust problem. Use Pangborn facilities today and be sure of the best in Dust Control.

Original "E" Award received March 13, 1943. Renewal of award with white star added to banner November 5, 1943.

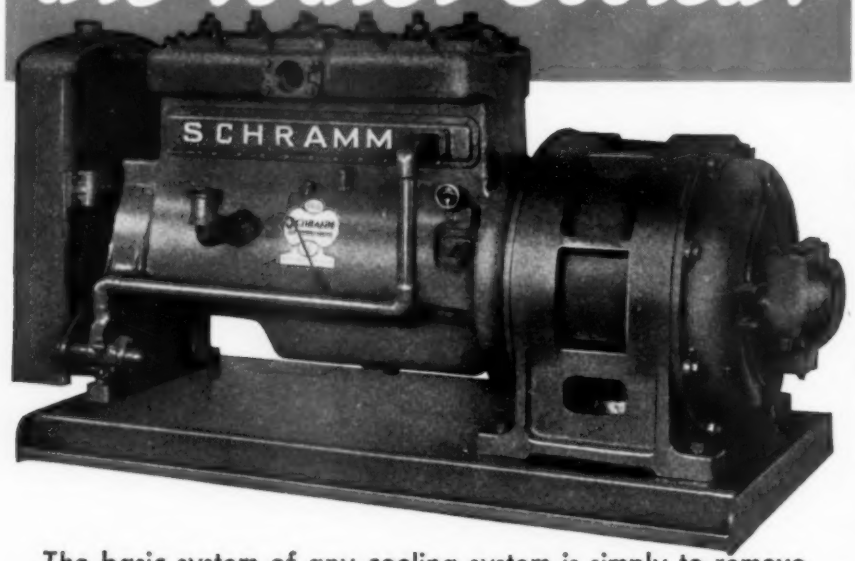
"Pangborn Dust Control is Protection for Production"

PANGBORN

WORLD'S LARGEST MANUFACTURER OF DUST COLLECTING AND BLAST CLEANING EQUIPMENT

PANGBORN CORPORATION · HAGERSTOWN, MD.

Why SCHRAMM COMPRESSORS are Water Cooled!



The basic system of any cooling system is simply to remove heat of piston travel and reciprocating parts from the surrounding metal as quickly as possible by the cooling medium. Heat travels from metal to water 200 times faster than from metal to air. By using water to carry heat away and by providing water jackets which completely surround compressor cylinders and heads, SCHRAMM achieves the following outstanding advantages:

...assured uniformity in cooling.

...elimination of unequal expansion and contraction which might cause distortion.

...absolute control of operating temperatures to the desired degree.

...longer life to compressor parts.

...higher efficiency of compressive cycle.

...higher compressor capacity at lower power cost.

...greater capacity in smaller overall space requirements.

...ability to provide compressed air efficiently under any and all temperature conditions.

...ability to provide compressed "air where it's needed," regardless of the amount of water available for cooling. SCHRAMM compressors are built in types equipped for re-cooling water (as well as for running water).

Get all the facts . . . **NOW!**

Write at once for complete details. Send for Catalog No. 42-S.

SCHRAMM, INC., WEST CHESTER, PA.

THE COMPRESSOR PEOPLE

SCHRAMM *Air Compressors*

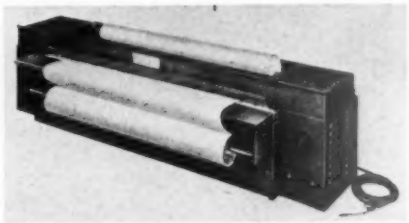
leaf pattern 17 inches across its widest point. The light can be raised or lowered, and tilted between vertical and 30 degrees below horizontal. It is controlled by means of a foot-operated switch.

Self-Priming Pump

Allis-Chalmers Mfg. Co., Milwaukee, is introducing a new type self-priming pump. An improved automatically controlled valve is said to be an important factor in the quick and effective self-priming action of the pump. The impeller has a thick vane with rounded inlet edges, permitting the pump to pass fairly large solids. A complete line of 1 to 6 inch sizes is planned, involving capacity up to 1400 gallons per minute and heads up to 100 feet or over. At present, only 2 and 3 inch sizes are available.

Continuous Printer

Peck & Harvey, 4327 Addison street, Chicago, have developed two new table type machines for producing blueprints or direct process black and white prints up to 44 inches wide in any lengths at



a speed up to 42 inches per minute. Mercury vapor tube lamps are employed. Speed is controlled by a constant current rheostat. Models are available with either one tube or two tubes. Overall dimensions of the printer are 63 inches long, 16 inches wide and 16 inches high.

Office Light Fixture

Curtis Lighting Inc., 6135 West 65th Street, Chicago 38, has designed a new fluorescent lamp fixture for use in general offices and drafting rooms. Units are available for ceiling mounting or as pendants, and the former also can be used in a continuous line. Each unit accommodates four 40-watt (48-inch) fluorescent lamps, and is 14 inches wide and 48¾ inches long. Complying with government regulations on metal use, the louver assembly, ballast shields and reflector are made of a nonmetallic material and finished glossy white with a baked synthetic which is said to have a high reflection factor.

DUPLEXING IN MALLEABLE IRON PRODUCTION

(*Continued from page* 123)

is flowing through the tap hole should be as brief as possible. An effort should be made to keep this time down to less than 30 seconds per tap.

Fig. 6 includes two illustrations of cupola performance other than that desired. The one designated *Performance Y* illustrates an operation in which the bed coke height is too great so that conditions in the cupola did not reach equilibrium 8 minutes after the air supply reached the tuyere zone of the cupola. Whereas this time element in *Desired Performance* is a constant of 8 minutes, in *performance* Y it may be most any time from 20 minutes to 50 minutes. The numbers on this curve, i. e., 1, 2, 3, and 4, represent taps and it should be noted that the time interval from one tap to another is not uniform and that the elapsed time is extended. The curve *performance X* illustrates performance when the coke bed height is too low, and irregularities are encountered in the tapping frequency and elapsed time.

Factors Affect Performance

When a time study is made of the cupola operation for either consecutive days or consecutive hours, and when these studies are presented in graph form and superimposed over each other, the depressed slope of the curve *performance Y* is due to such factors as using less air or increasing the amount of fuel and the increased slope of the curve *performance X* is due to more air or decreasing the fuel.

If a time study is made of the cupola and the various taps, i. e., 1, 2, 3, 4, etc., do not fall on a straight line but make a very irregular curve, the cupola is *bridging* or *hanging up* and the continuity of the cupola melting process is being interrupted by failure of materials to move continuously into the melting zone. The major cause of discontinuity in the cupola melting furnace is oversize materials in the charge and may be either oversize coke particles or oversize materials in the metal charge or both. When this type of curve is associated with cupola operation one can be quite sure that the cupola refractories are taking much more abuse than when a continuous melting cycle is achieved.

When the cupola is tapped either by the front slagging spout method or with continuous flow of metal through a calibrated tap hole, the time study may be made at the cupola charging door if there is no simple way to check the quantity of metal tapped from the cupola.

There is considerable difference between batch melting in air furnaces and duplex melting. Batch melting furnace tapping temperatures usually are between

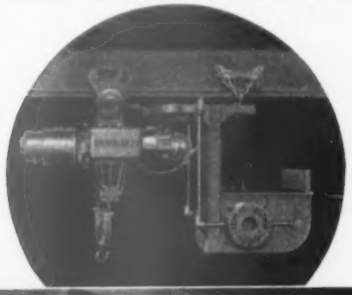
Gangway for Monorails!

"AERIAL RAILWAYS OF INDUSTRY"

Where speed must team up with accuracy and dependability in handling loads, indoors or out, or both, Shepard Niles Cab-Operated Monorails are proving themselves to be of invaluable assistance in many busy plants. "Just couldn't get along without them," is the way one manufacturer puts it. Let us show you what this equipment will do for you. There is a Shepard Niles representative in or near all war production centers.

Above: Shepard Niles Cab-Operated Monorail equipped with clamshell bucket. For indoor or outdoor service.

Below: Shepard Niles Trailer-type Monorail. Furnished with either open or enclosed operator's cab.



Shepard Niles Cupola Charger Monorail for charging cupolas or for general yard handling.

Shepard Niles

CRANE & HOIST CORPORATION

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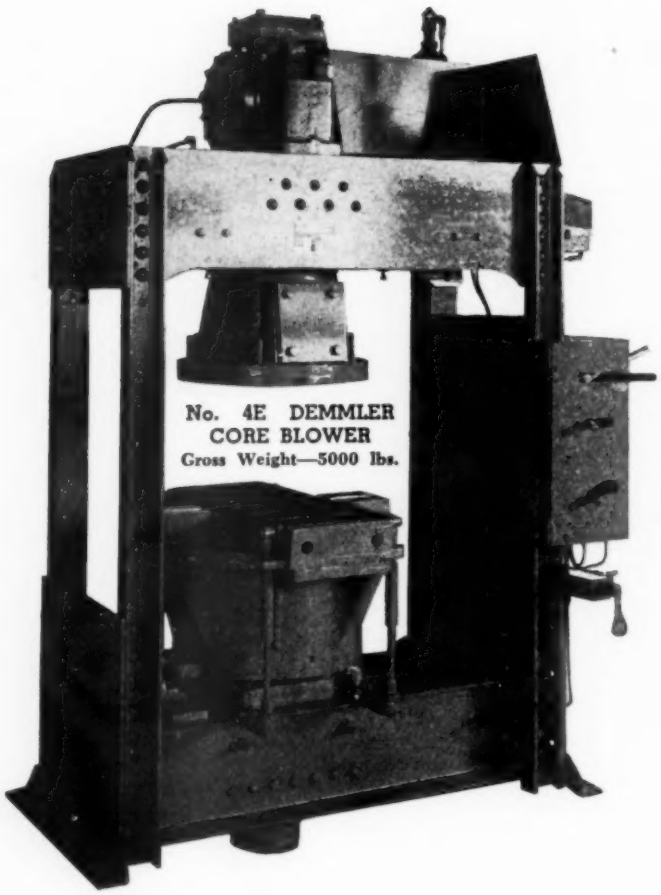
DEPENDABLE **CORE BLOWING** EQUIPMENT



NEW HEAVY-DUTY BLOWER

FOR MOTOR CASTINGS WORK . . .

Strictly for BIG Cores and Fast Production

Takes Core Box up to 18" x 24"

Designed as a special blower for a leading producer of airplane motor castings, this unit is now offered as a standard Demmler blower. Features include an accurate hydraulic core box draw, table equipped with Timken rollers, 12" diameter throat opening, control mechanism totally enclosed. The height of the frame may be adapted to varying sizes of core boxes.

Reports on this new machine from users indicate that it has unusual possibilities in production of aircraft, tank and truck motor castings. At the present time we can make good deliveries, and invite your inquiries.

WM. DEMMLER & BROS. · KEWANEE, ILLINOIS

CORE BLOWERS *Exclusively*

2750 and 2800 degrees Fahr. while duplex melting furnace tapping temperatures are usually 2900 to 2950 degrees Fahr. In batch melting, pouring ladles are used periodically while in duplex melting ladles are used continuously. Although duplex furnace tapping temperatures may be 100 to 150 degrees Fahr. higher than batch melting, the metal temperature at the mold shows an even greater increment, due to the hot ladles in continuous service. This improved metal condition at the mold permits either more latitude in the selection of the carbon-silicon chemistry, particularly in the direction of higher silicons, or more latitude in the section sizes of castings that may be produced with the same chemistry. It should be noted that the improved temperatures should be utilized in the heavy sectioned castings and that it would be desirable to improve the refractoriness of molding sands rather than lower the pouring temperature of metal when pouring heavy sections in order to favor the deficiencies of a not too satisfactory molding sand.

Fig. 1. (THE FOUNDRY for January) the carbon curve between cupola charge and cupola product, is drawn to show seven chemistries in the product of 3.00, 2.90, 2.80, 2.70, 2.60, 2.50, and 2.40 percent carbon, respectively, and it should be noted that significant changes are called for in the carbon chemistry of the cupola charge to achieve these carbon levels in the product.

Changing Carbon Content

The change of carbon in the secondary furnace of a duplexing system is dependent on (1) the capacity of the secondary furnace in relationship to the capacity of the cupola (2) the type of flame used on the secondary furnace and (3) the use of raw materials such as steel scrap or petroleum coke to manipulate a carbon charge.

In the cupola-air furnace combination, it is desirable for the air furnace to hold 2½ times the amount of metal melted in the cupola per hour; that is to hold 25 tons with a cupola melting 10 tons per hour. Some air furnaces in the cupola-air furnace combination hold only one-half the cupola's hourly output. The capacity of the air furnace in a duplexing system may be approximated on the basis of 8 square feet of hearth area per ton of molten metal. When the capacity of the air furnace is in good balance with the melting rate of the cupola it serves to (1) maintain chemistry with a minimum variation, (2) provide sufficient time to superheat metal to 2900-2950 degrees Fahr., (3) provide time to reduce carbon, and (4) obviate need to alter the cupola charge from time to time during a melting day to adjust chemistry variations that may be encountered.

It is recognized that the time required to malleabilize white iron to a fully ferritic malleable is a function of the (1) annealing furnace temperatures, (2) casting sections, (3) the chemistry of the white iron, (4) the deviations in chem-

istry from the desired mean chemistry, (5) the amount of hydrogen or other gases present which stabilize cementite, (6) the amounts of such elements as copper, nickel, molybdenum, chromium, manganese and tin present.

The significant influence of hydrogen may now be reduced from a variable factor to a constant factor by conditioning the cupola air supply to a uniform and low moisture content, at approximately 40 grains of water per pound of air. Severity of this influence is associated with geographic location of the malleable foundry, with the result that a foundry located at St. Paul, will encounter less of a problem than one located at Birmingham.

The most significant variable is the deviation in carbon and silicon chemistry from the desired mean chemistry. Fig. 7 illustrates the permissible deviations in carbon and silicon chemistry for fast annealing of ferritic malleable.

Burning Powdered Coal

When the duplexing furnace is fired with pulverized coal it will consume approximately 225 pounds of coal per ton of metal using as little as 175 pounds of coal per ton of metal when the installation is working at peak hourly output and up to 275 pounds of coal per ton of metal when the hourly output is only 50 to 60 percent of peak capacity. These fuel consumptions would be less when metal temperatures less than 2900-2950 degrees Fahr. are desired. Fuel consumption is based on using room temperature air and would be slightly less if preheated air was used. If the duplexing furnace is fired with oil it would require 20 to 25 gallons per ton of metal duplexed. If the secondary unit is an electric furnace it would use approximately 175 kilowatt hours per ton of metal duplexed except when cold additions of steel scrap are added to the electric furnace, when power consumption would approximate 225 kilowatt hours per ton of metal.

The nominal melting rate of a cupola is usually 25 pounds of metal per square foot of cupola area, per minute. A 48-inch diameter cupola having an area of 12.57 square feet would have a nominal melting rate of 9.4 tons per hour. The nominal melting rate of a cupola in a malleable foundry is somewhat more than its normal application and is of the order of 33 to 37 pounds of metal per square foot of cupola area per minute. This somewhat abnormal melting rate of a cupola melting malleable iron is due primarily to the extreme importance of fuel in the process, the need to use it with great discretion, and also because the sections of materials in the charge are relatively light and therefore melting temperatures may be reached throughout the mass in a short time interval.

The cupola normally consumes about one pound of air for each pound of metal. When 25 pounds of metal per square foot of area per minute is melted, about 25 pounds of air per square foot

Vitrified Bonded Wheels are very much in the Cortland production picture — and the Circular Continuous Tunnel Kiln shown here is a step toward better delivery on this type of grinding wheel, in sizes of 16″ and smaller. You can depend upon Cortland for quality — and for better deliveries than ever before when you want them.

* * *

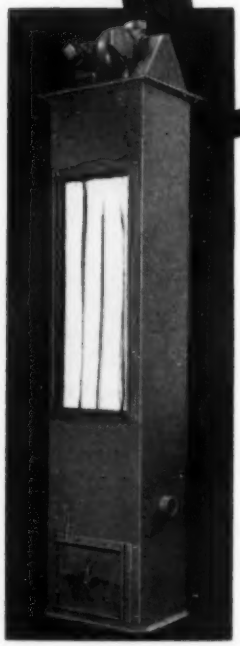
Resinoid Bonded Wheels in all standard sizes for weld grinding are available for the usual prompt shipment.

CORTLAND GRINDING WHEELS CORP.
6 CORTLAND STREET, CHESTER, MASS.

CORTLAND
GRINDING WHEELS

CHECK CHART

- ☑ High Efficiency
- ☑ Simplicity of operation
- ☑ Low operating and maintenance costs
- ☑ Rugged construction
- ☑ Modern engineering features
- ☑ Approved by health, safety, labor and insurance commissions
- ☑ Designed and built by experienced dust control engineers



DUST control is too important for you to be satisfied with anything less than factors like these—factors that mean top efficiency in operation and long service life. That is why spotlight attention is being focused so strongly upon Dustube Dust Collectors today. Compare them point by point. See how well they coincide with your own views on what the ideal dust control system should include. Write for descriptive Bulletin No. 112.

AMERICAN
FOUNDRY EQUIPMENT CO.
505 S. BYRKIT ST. • MISHAWAKA, INDIANA

DUSTUBE
Dust Collectors

of area per minute is required. In selecting a blower it is desirable to secure one having a capacity of 30 pounds of air per square foot of cupola area per minute and to anticipate an operating pressure of at least 1½ pounds. One pound of air (at 14.7 pounds and 60 degrees Fahr.) is approximately equivalent to 13 cubic feet. Although the ratio between pounds of metal melted and pounds of air consumed in the cupola is usually 1 to 1, its application on malleable melting is approximately 1 pound of metal to 0.8 pounds of air.

This is the concluding article of two written by Mr. Reese on duplexing in the production of malleable iron castings. The first appeared in the January issue. The author, who has been associated with the War Production Board since early in 1942, is foundry research engineer, Research and Development Division, International Nickel Co., New York.

THE EDITORS

Stevens Conducting Foundry Lectures

A lecture course on "The Fundamentals of Foundry Engineering" is being conducted for the second year by the Stevens Institute of Technology, Hoboken, N. J. The course consists of 24 free lectures by 17 leading engineers, foundrymen and metallurgists from industry and the Navy, and extends from Jan. 6 to March 24. The Educational committee of the A.F.A. and the U. S. Office of Education are co-operating in presenting the lectures. The latter is defraying tuition for the course through its engineering, science and management war training program.

Book Review

Principles and Practice of Flow Meter Engineering, by L. K. Spink, 232 pages published by Foxboro Co., Foxboro, Mass., price $3.

This is the sixth edition of a widely accepted standard text and guide first published in 1930. The present work has been enlarged to bring it up to date and increase its usefulness. Profusely illustrated with halftones, diagrams and curves, it contains tables and formulas for ordinary liquid or gas flow computation. Some of the features in the section on liquids include methods for determining compressibility factors of liquids at temperatures near the critical, a new and more accurate method of correlating temperature expansion data on petroleum oils, a quick method of correcting for tap locations, and a short-cut method of correcting for viscosity. In the section on gases several methods for correcting for viscosity effects are suggested. Theoretical discussion as well as working equations and tables for moisture and supercompressibility are given. A new and simple type of intermediate pressure device which eliminates bypassing gas is described, and recent findings on measurement of pulsating gas flows are presented.

STRUCTURE CONTROL OF GRAY CAST IRON

(*Continued from page* 114)

structures occur in gray iron castings. However, most foundrymen have noticed that the chilling tendency of their iron is likely to be greater on one day than another. In fact, the tendency toward hard spots and chilled corners may vary rapidly even in a single day's heat, even though the chemical analyses remains relatively constant. This phenomena is usually the direct reflection of the variation in the amount of type D graphite structure present in the iron, and gives the foundryman a quick indication of the condition of his iron. Irons which show an abnormally high chill for their composition usually contain appreciable areas of type D graphite. It is interesting to note that these high chill irons usually exhibit large areas of primary ferrite in spite of the fact that they are hard and difficult to machine. This leads to a condition in which an iron has poor wear resistance and unsatisfactory machining properties.

Hardness and Strength

Another frequent indication of the presence of the type D structures is a combination of low strength and high hardness. If tensile strength is divided by brinell hardness number a ratio that varies all the way from 140 to 260 may be obtained. In the absence of alloying elements which may change this ratio, it can be assumed that the low ratio irons, from 140 to 180 for example, contain appreciable percentages of type D graphite. These low ratios usually are undesirable since they indicate relatively poor machining characteristics.

Both excessive chill and low tensile strength to brinell hardness ratios are merely reflections of type D graphite structures. They supply a convenient method of estimating the probable extent of such structures, and the desirability of inoculation, although the only definite method of determining the presence or absence of such structures is by actual microscopic examination. There are a number of other short cuts to estimating the presence of type D graphite, but they should be used carefully as indications only and not as positive proof. Sometimes the appearance of the fracture is a good indication. Sooty, dark structures, particularly when a visible white network is present, usually indicate a need for inoculation. Likewise an unusually low deflection is a fairly reliable indication of unsatisfactory structure.

One very satisfactory method of estimating the need for inoculation in any given foundry is to plot the tensile strength values against the carbon-equivalent (total carbon plus 1/3 silicon) as shown in Fig. 5. It will be apparent

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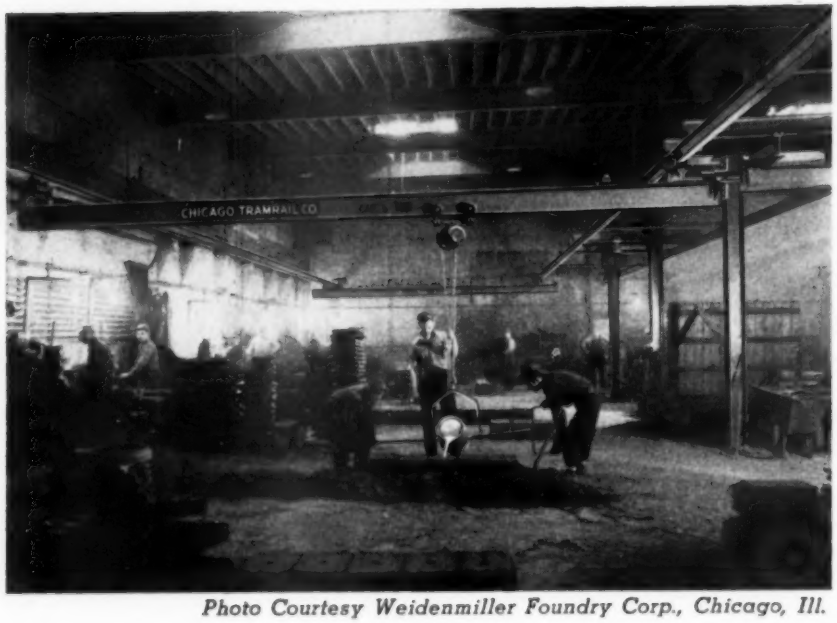

Photo Courtesy Weidenmiller Foundry Corp., Chicago, Ill.

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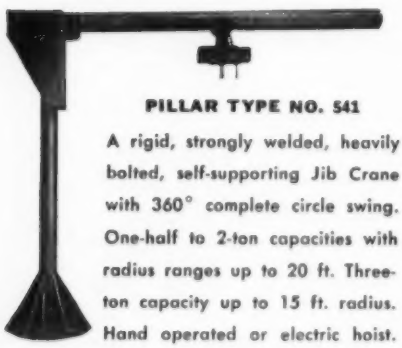
★ Above illustration shows an actual non-ferrous foundry installation of light-duty, Chicago Tramrail, hand-pushed Underhung Cranes covering the entire moulding floor area.

The hot metal is quickly delivered from furnaces at the right half of the building (which is also covered by cranes) then transferred to the moulding floor cranes which span the entire moulding area. This is but one of many hundreds of low-cost installations, designed and "built-in" by Chicago Tramrail engineers for speedier and safer foundry operation.



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immediately whether the irons are consistent in behavior or not. If the points do not plot on a given curve or within a reasonable spread it is evident that the irons below the trend line require additional structure control. Under some conditions the number of points below the inoculation curve may be 75 to 80 per cent of the total. *Any irons* considerably below the curve are undesirable and may be extremely deleterious to the foundryman's reputation with his customers.

It is a simple matter to plot a curve similar to Fig. 5 for your own irons and determine for yourself if your irons are consistent in strength or whether structure control is necessary for certain analyses. Obviously, however, you cannot predict which irons will require inoculation and which will be satisfactory without treatment. Therefore, you must decide what percentage of your irons are unsatisfactory and whether the number of such off irons justify inoculating all the irons to insure that the proper ones receive the required treatment.

Effect of Cooling Rate

It should be emphasized at this point that type D structures are rarely found throughout an entire casting since structure is related to cooling rate. Unless the need for inoculation is unusually great, these structures only occur in localized areas. The number of such areas determines the extent to which the mechanical and physical properties will be affected. Although type D structures and normal structures may be immediately adjacent to each other, the general location of the type D areas is in accordance with certain fundamental factors. In brief, type D structures are most pronounced in zones of rapid cooling. This is illustrated in Fig. 6, which is a diagrammatic presentation of the effect of cooling rate based on the wedge type casting.

Notice that the type D zone is immediately behind the chill in a definite zone of cooling rate. The width of this zone depends upon the tendency of the iron to exhibit type D graphite. In other words, this zone may be only a thin line at the skin or just under the skin of a casting, or it may extend sufficiently to include the entire section. This is an important consideration since it means that if type D structures do occur, they will be most prevalent at the machining or the wearing surface where they may be most objectionable and detrimental. Some producers of wear resistant castings, such as machine tools, take advantage of the effect of cooling rate by using only sufficient inoculation to confine the undesirable structures to a narrow zone which is subsequently removed during the machining operation. This leaves a good wear resistant structure exposed at the bearing surface. The use of a larger amount of inoculant would have the advantage of more completely removing an undesirable structure, and thereby be a safer practice in most cases.

(*To be continued*)

OBITUARY

MORTON T. MORTENSEN, 57, Detroit district manager for the American Foundry Equipment Co., died in that city Dec. 15. He had been with the company since early in 1940, succeeding the late Hutton H. Haley. Born in Big Rapids, Mich., Mr. Mortensen

MORTON T. MORTENSEN

received his early education at Manistee, Mich. He joined the Michigan Steel Casting Co., Detroit, in 1910 as works engineer, continuing with that company until 1919 when he became associated with the Aluminum Co. of America as works engineer. Later in the same year he joined the foundry equipment department of J. W. Dopp & Co., Detroit, subsequently becoming vice president. In 1923 Mr. Mortensen was made Detroit representative of the W. W. Sly Mfg. Co., Cleveland, remaining in that capacity until 1939 when he joined the Schmieg Sheet Metal Works, Detroit. He was a member of the Detroit Chapter of the A. F. A.

• • •

Frederick B. Whitlock, 71, since 1927 sales manager of Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich., died there Dec. 25. He was a partner of Frank Lewis in the Indianapolis Casting Co. from 1894 to 1913 when he transferred to Cleveland to become president of Interstate Foundry Co. He remained there 14 years and joined C-W-C in 1927.

• • •

John E. Jones, 79, pioneer in the production of silvery pig iron, and chairman of the Globe Iron Co., Jackson, O., died Jan. 5 at his home in that city. Mr. Jones formerly was president of the company, having been succeeded in that capacity by his son, Edwin A. Jones, in 1939. Mr. Jones' father, Eben Jones, and his grandfather, Thomas T. Jones, a native of Wales, were identified with the early iron industry of this country.

The Jones family has been active in the iron business in Jackson county, Ohio,

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since 1837. In that year Mr. Jones' grandfather organized the Jefferson furnace. In 1872 his father and grandfather helped to organize the Globe Iron Co. at Jackson. Ten years later Mr. Jones left high school to join the company, beginning as storekeeper and working up through positions of increasing importance to become general manager in 1898. He became president in 1921.

• • •

Harold I. Yeckley, 54, secretary of the Lorain Brass Co., Lorain, O., died in that city Dec. 27. A graduate of Pennsylvania State College, Mr. Yeckley was associated with the National Tube Co. at Lorain from 1914 until 1918. In the latter year, he and his brother, E. G. Yeckley, now president of the Lorain Brass Co., obtained control of the firm.

• • •

David W. Rodger, 50, vice president, secretary and sales director of Federal-Mogul Corp., Detroit, died in that city, Jan. 4. He had been active for many years in the National Standard Parts Association, serving as president in 1934-35. A month ago he was elected a director of the Automotive Council for War Production.

• • •

George Birkenstein, 44, president of Anker-Holth Mfg. Co., with plants in Chicago and Port Huron, Mich., and head of George Birkenstein & Co., Chicago, died Jan. 2 in the latter city. Prior to forming his own company to deal in ingot metals he was for a number of years associated with S. Birkenstein & Sons Inc., Chicago.

• • •

Harry T. Odenkirk, 73, sales manager for Keen Foundry Co., Griffith, Ind., died Dec. 14. Prior to joining the company 9 years ago, he was general superintendent of Western Foundry Co., Chicago, with whom he had been associated for 33 years.

• • •

John L. Sendner, master molder of the foundry, Puget Sound Navy Yard, Bremerton, Wash., died Dec. 19. Mr. Sendner was born at Fairbold, Minn., March 8, 1883. He was one of the well-known foundrymen of the Pacific coast and was master molder for the past 31 years.

• • •

Louis Birkenstein, 77, organizer and for many years head of S. Birkenstein & Son Inc., Chicago, smelter and refiner of ingot metals, died Dec. 27 in that city.

• • •

Hugh J. Homewood, 49, treasurer of Gisholt Machine Co., Madison, Wis., since 1940 and affiliated with the company for nearly 20 years, died Nov. 7.

• • •

Henry E. Mills, 66, one of the organizers of the H. E. Mills Mfg. Co., Cleveland, died Dec. 7, in Syracuse, N. Y. Mr. Mills was born in Syracuse, son of the late Charles E. Mills, who founded the Mills Oil Co. in 1877 and sold it in 1930. Following graduation from

the New York Military Academy, Henry Mills was associated with his father in the oil business. Early in the present century, father and son organized the H. E. Mills Mfg. Co., to make dry core compounds used in the foundry. In 1937 the business, which had been moved to Cleveland, was sold to a group of employes who had been with the company from the beginning.

° ° °

Theodore W. Monroe, president and director of the Hartford Electric Steel Corp., Hartford, Conn., and its affiliated company, Roxbury Steel Casting Co., Boston, died Nov. 30. He had been president since early in 1942.

° ° °

Gilbert F. Stone, 56, manager of the employment department of the Crane Co., Chicago, died Dec. 21 in that city. He had been associated with the company 40 years.

° ° °

Robert E. Magee, 58, for 25 years representative in the Houston, Tex., district for the American Cast Iron Pipe Co., Birmingham, Ala., died in Houston Dec. 30.

° ° °

Chester H. Pape, 59, president of the Independent Foundry Co., Portland, Oreg., died Dec. 21 in Chicago while enroute to Annapolis, Md.

° ° °

W. J. Ehrsam, 72, president and general manager of the J. B. Ehrsam & Sons Mfg. Co., Enterprise, Kans., died Dec. 28.

School Starts Work On Second Unit

Illinois Institute of Technology, Chicago, has started construction of the second permanent unit of its $3,100,000 campus development program. The new building will house the automotive research laboratory of the Armour Research Foundation, and will encompass the ceramics building, construction of which was begun last September.

Malleable Symposium

American Foundrymen's Association, 222 West Adams street, Chicago, has made available a 243-page bulletin comprising a "Symposium on Malleable Iron Melting" which contains 15 papers relating to the subject. Ten of the papers were presented at the 1943 annual meeting of the association while the remaining five were presented in previous years. Topics covered by the papers include information on different types of melting units and results obtained, refractories, thermal balances, measuring and controlling temperatures, and developments in melting malleable cast iron. Copies of the bulletin may be obtained from the association for $3.

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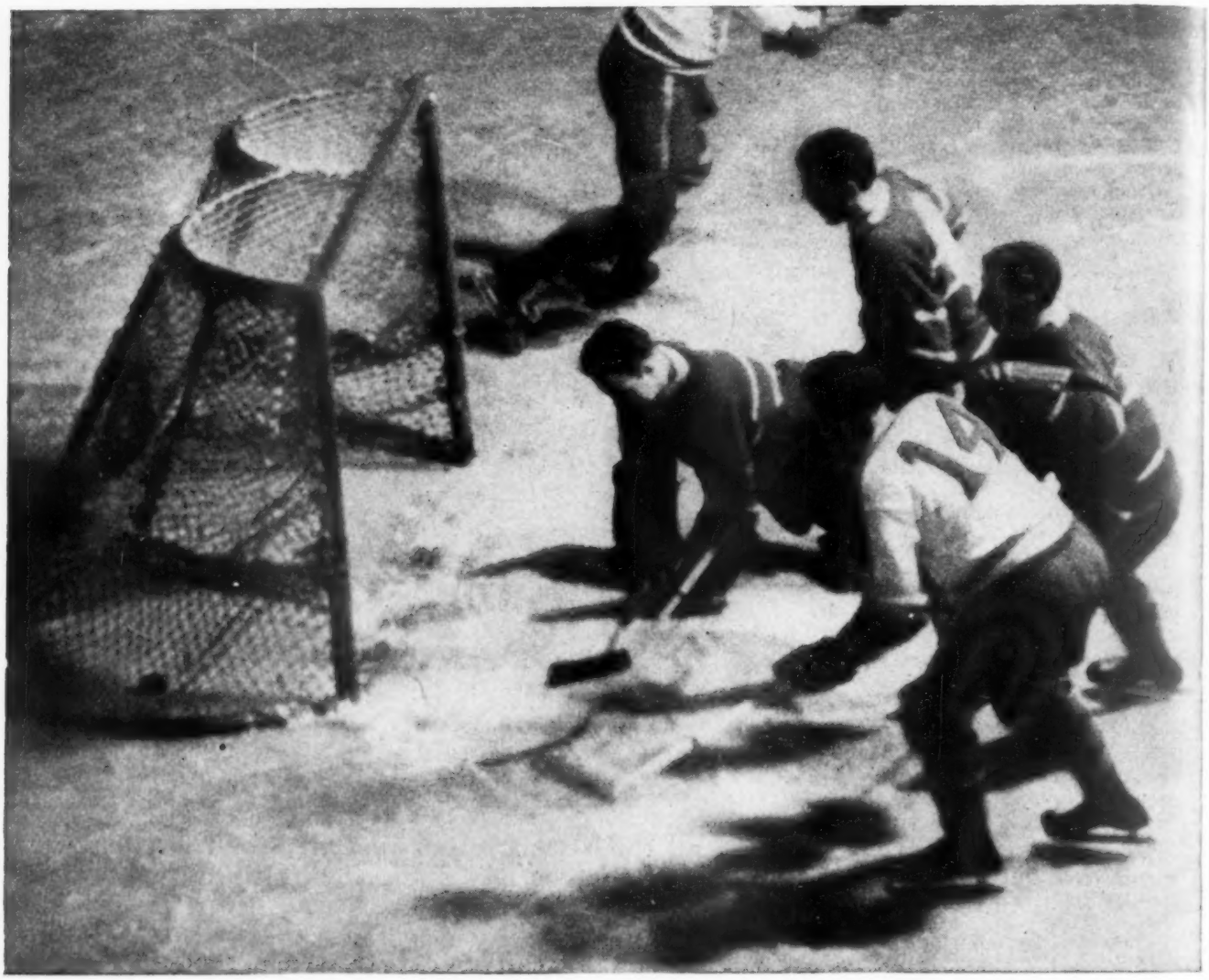

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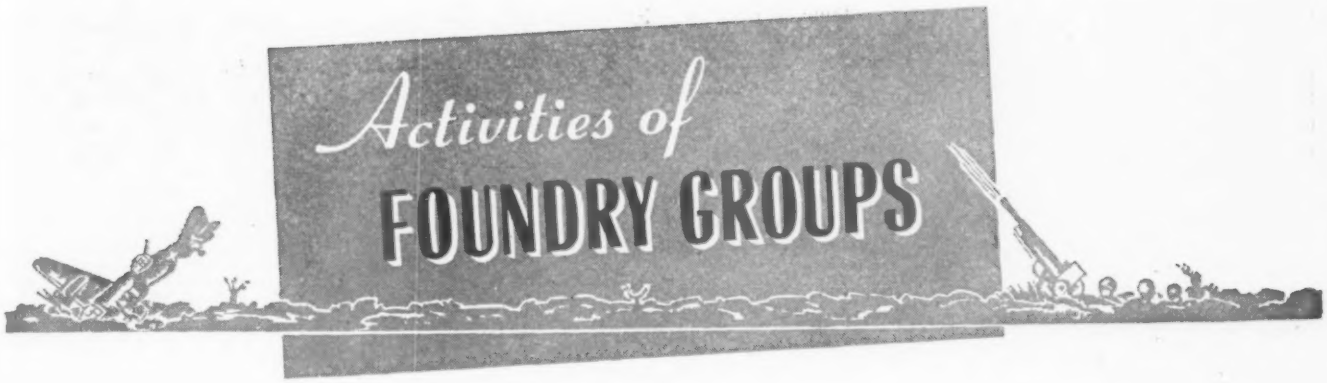


Rochester

GETTING off to a flying start which augurs well for future activities, the newly organized Rochester Chapter of the A.F.A. held its first meeting on Jan. 6 at the University of Rochester with 110 members and guests present. Henry B. Hanley, American Laundry Machinery Co., Rochester, N. Y., chairman, called on E. N. Van Billiard, Progressive Foundry Co., Rochester, chairman of the nominating committee, for a report on the proposed slate of officers. Mr. Van Billiard announced that the committee nominated the following officers and directors for 1944:

President, Henry P. Hanley; vice president, C. Vaughn, Ritter Co., Rochester; secretary-treasurer, Donald E. Webster, American Laundry Machinery Co. Directors. I. A. Billiar, Symington-Gould Corp., Rochester; Walter G. Brayer, Bausch & Lomb Optical Co., Rochester; L. C. Gleason, Gleason Works, Rochester; Max Ganzauge, General Railway Signal Co., Rochester; Herman Hetzler, Hetzler Foundry Co., Rochester; James E. McHenry, Gleason Works, Rochester; Walter F. Morton, Josiah Anstice & Co., Rochester; Irving Rosenthal, Rochester Refining & Smelting Co., Rochester, and E. N. Van Billiard. Since no further nominations were received, the secretary was ordered to cast a unanimous ballot for their election.

Newly elected President Hanley then appointed the following chairmen of committees: E. N. Van Billiard, membership; Walter F. Morton, program and publicity; Walter G. Brayer, finance; Max Ganzauge, regional meetings, and Irving Rosenthal, entertainment.

Fred Sefing, International Nickel Co. Inc., New York, doubling in brass as representative of the national headquarters of A.F.A., and later as technical speaker, made the official presentation of the combination baby rattle and gavel which customarily is given to the most recently formed chapter. Mr. Sefing congratulated the members on the arrival of such a lusty infant, and stated he felt certain that more would be heard from the chapter as it grew and progressed.

In his technical address which followed, Mr. Sefing dealt with methods for producing sound castings, and pointed out that the gate and riser design should be such as to lead clean metal into the mold cavity and feed the casting during solidification. Skim gates and slot gates are advantageous in supplying clean metal, and prevent turbulence and agitation. Mr. Sefing said that he preferred the rectangular shape gate as it permits a smoother flow.

Freezing of metal proceeds from the thinnest section and coldest metal so that the gating and risering should be considered from that viewpoint to attain directional solidification. Adequate venting is necessary to secure sound castings. In many cases chills are necessary since it is impossible to locate risers properly to provide feeding. In such cases the chills must be clean, of sufficient section to perform their intended purpose, and designed to cover only the area desired. Mr. Sefing discussed many other phases involved in producing sound castings and the members joined in an interesting discussion of the procedures.

Next meeting of the Rochester Chapter will be held at the Seneca hotel, Rochester, on Feb. 5 at which time the Western New York Chapter will participate.—*Edwin Bremer.*

Metropolitan

B. A. MILLER, chief metallurgist of the Cramp Brass & Iron Foundry Division, Baldwin Locomotive Works, Eddystone, Pa., was the principal speaker at the Jan. 3 meeting of the Metropolitan Chapter of the A.F.A., held at the Essex House, Newark, N. J.

Mr. Miller, who also is vice chairman of the Brass and Bronze division of the A.F.A., spoke on "Copper Base Alloys," a subject on which he is an authority. Both the talk, which was illustrated with slides, and the subsequent discussion period were interesting and educational.

The meeting was presided over by J. W. Reid, chapter chairman, assisted by Sam Tour who acted as technical chairman. Notwithstanding the inclement weather, a good turnout of members and guests was recorded.—*Henry C. Seidel.*

Birmingham

"THE Foundry Industry—Present and Future," was the theme of Warren Whitney, manager, National Cast Iron Pipe Division, J. B. Clow & Sons, at the opening meeting of the 1943-44 season, Birmingham District Chapter of the A.F.A. held at the Tutwiler Hotel, Dec. 17.

In reviewing the activities of industry in general and the foundry branch in particular, he pointed out that progress in conversion to war production during the 19 months preceding Pearl Harbor had been rather disappointing, but after Dec. 7 the program was stepped up rapidly, and during a like period production had attained sufficient proportions to supply the demands of our own armed forces, with a considerable volume available for our allies. Many foundries throughout the state have been awarded the Army-Navy "E" for excellent performance.

Mr. Whitney stated that one result of the war effort has been the creation of a faith and confidence in the foundrymen's ability to perform successfully any tasks assigned them—which would live on into the postwar period—and that the industry would stand ready to convert to civilian production and assume its full responsibility to meet all peacetime demands.

He stated that it was impossible for anyone to chart a course for business in the postwar period which would be of any practical value. The many problems over which industry would have no control—the accumulation of reserves for conversion and working capital, labor, taxes, and governmental rules and regulations—could be handled so as either to make or mar the postwar picture.

Abe S. Holberg, president, Alabama Clay Products Co., was dinner host to the chapter members. Chairman W. Carson Adams presided and introduced

a number of guests, and recognized Dr. James T. McKenzie, chief metallurgist American Cast Iron Pipe Co., and L. N. Shannon, vice president, Stockham Pipe Fittings Co., as the only life members of the national body in the South. The chapter had an auspicious opening, and the monthly meetings will have outstanding speakers on problems of vital and absorbing industry to the foundrymen. W. Carson Adams is chairman; R. L. Ogden, president, Ogden Foundry Co., vice chairman; Howard A. Nelson, Hill & Griffith Co. secretary-treasurer. R. L. Donaldson, Woodward Iron Co., is chairman of the program committee.—*H. B. McLaurine.*

Philadelphia

THE monthly meeting of the Philadelphia Chapter of the A.F.A., held in the Engineers Club on Dec. 10, attracted approximately 100 members and guests to hear two very interesting talks.

One talk was by the Rev. Clarence Rahn, Temple, Pa., an outstanding Pennsylvania Dutch minister, who travels 30,000 miles a year in connection with his charge of four churches in his district of Berks county. Rev. Rahn gave a humorous and interesting talk, based on the customs of the Pennsylvania Dutch in and around Berks county.

The technical talk was given by J. E. Crown, superintendent of steel and nonferrous foundries of the U. S. Naval Gun Factory, Washington. Although his subject was to be "Cleaning Equipment", he pointed out that since this was such a broad field, he would confine his remarks to hydroblasting. The steel division of the government gun factory, as Mr. Crown explained, has one of the country's most elaborate systems for hydroblasting and has used the equipment for 2 years. The plant is able to control an excessive dust condition, and has made substantial savings in the reclamation of core rods, which are reclaimed in their original state, thus eliminating any straightening and securing additional life. This is in addition to a saving of approximately $450 per day in sand alone.

The equipment reclaims and puts back into service approximately 40 tons sand per day. Nozzle life is between 400 to 500 hours, and general maintenance cost is said to be considerably lower than would be expected from this type of equipment. Mr. Crown's talk was accompanied by slides, showing the complete installation. Many questions were asked Mr. Crown at the end of his talk.—*William S. Thomas, chairman, publicity committee*

Northeastern Ohio

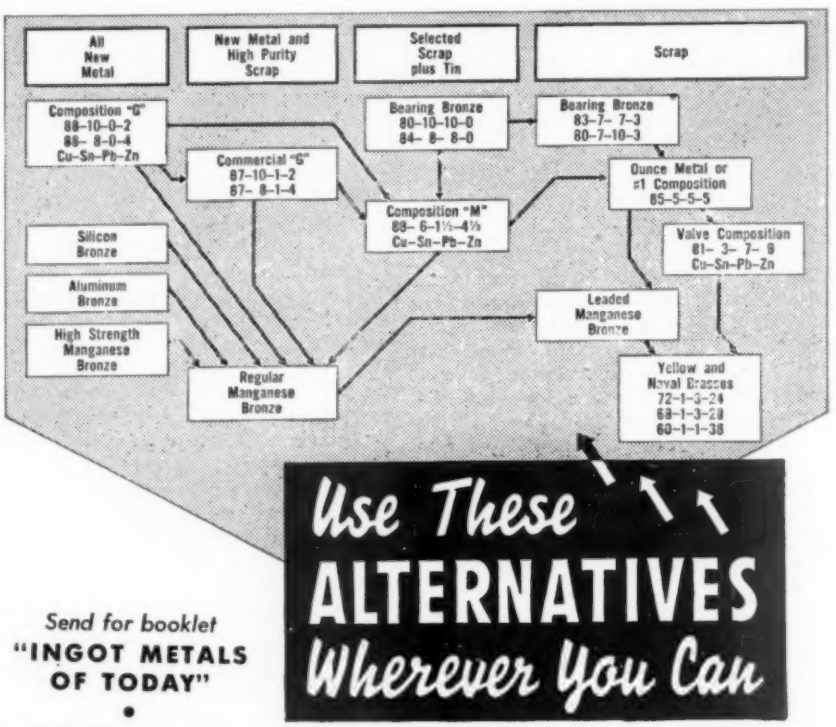
NORTHEASTERN Ohio Chapter of the A.F.A. held its annual Christmas party at Hotel Carter, Cleveland, on Dec. 16, and as in previous years attendance was limited to the seating capacity of the Rainbow room, or 1000. Those present enjoyed an excellent turkey dinner with all the fixin's. Following the dinner the members and guests of the chapter saw a 2-hour floor show arranged under the direction of L. P. Robinson, chairman of the entertainment committee.—*Edwin Bremer, chairman of publicity.*

Western New York

A DISCUSSION on "Engineered Properties of Ferrous Materials," by Tom E. Barlow, foundry engineer of Vanadium Corp. of America, Detroit, featured the Dec. 3 meeting of the Western New York Chapter of the A. F. A. Frank E. Bates, chairman, presided with an attendance of about 80 members and guests.

Howard K. Rose, membership chairman, reported that the Western New York Chapter ranks second in the country in new memberships obtained in 1943. Harold R. King, Metal & Alloys Specialties Co., was appointed chairman of the chapter's new Friendship committee, a group formed to report on sickness among members and generally to promote good fellowship in the chapter.

Mr. Bates then turned the meeting over to the technical chairman, Henry C. Winte, metallurgist, Worthington Pump & Machinery Corp., Buffalo, who introduced Mr. Barlow. Increased com-


All New Metal
New Metal and High Purity Scrap
Selected Scrap plus Tin
Scrap
Composition "G" 88-10-0-2 88- 8-0-4 Cu-Sn-Pb-Zn
Commercial "G" 87-10-1-2 87- 8-1-4
Bearing Bronze 80-10-10-0 84- 8- 8-0
Bearing Bronze 83-7- 7-3 80-7-10-3
Ounce Metal or #1 Composition 85-5-5-5
Composition "M" 88- 6-1½-4½ Cu-Sn-Pb-Zn
Valve Composition 81- 3- 7- 9 Cu-Sn-Pb-Zn
Silicon Bronze
Aluminum Bronze
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Yellow and Naval Brasses 72-1-3-24 68-1-3-28 60-1-1-38

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Ajax-Hamilton Gear Bronze
Ajax Nickel-Copper 50-50%
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Ajax Aluminum Alloys
Ajax Phosphor Copper
Ajax Silicon Copper
Ajax Nickel Alloys
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NOTE

*"Proper Melting Decreases Foundry Losses," contains interesting data. Also, the booklet, "Nonferrous Ingot Metals of Today." Write for both of these. They are free.

Notice how the arrows on the W.P.B. chart point to the *right*. . . . They show how alternative materials *currently available* can be utilized by foundrymen as now permitted by many designers. The purpose is to conserve primary metal at the mine through increased use of secondary ingots. Sometimes great ingenuity is called for, yet remember this:

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AJAX ENGINEERING CORP. Ajax-Tama-Wyatt Aluminum Melting Induction Furnaces

petition which the foundry industry will be required to face in the future will necessitate changes in production methods, according to the speaker. The industry must learn to control variables in foundry methods and materials if it is to achieve consistency in its product with economical processes. If a certain strength iron is specified, that particular iron should be made, and not a better or higher strength iron for which no higher price is obtained.

Control of iron does not stop at the cupola. Mold and core conditions must be correlated since often they are responsible for poor castings. The chill test is a valuable control medium for the gray iron foundry, because although it will not disclose composition, it will show the condition and machining characteristics of the metal. In connection with the new A. F. A. Committee on Chill Test, Mr. Barlow, who is chairman, said that his group would like to receive comments and suggestions on the subject. The carbon equivalent, which is equal to carbon plus one-third silicon, also is a good control medium, since as this value changes the tensile strength also will change.

Mr. Barlow then showed a number of slides illustrating control of gray iron structure by ladle inoculation.—*J. Ralph Turner, secretary.*

PLANTS NOW MELTING ALUMINUM ALLOYS ELECTRICALLY ENJOY THESE SPECIFIC ADVANTAGES...

1. **VASTLY INCREASED PHYSICALS** (tensile strength and elongation) in foundry, die-cast, or rolling mill products.
2. **DECREASED GAS ABSORPTION AND SEGREGATIONS** hitherto due to conventional melting practice.
3. **CLEAN-CUT, ACCURATE TEMPERATURE CONTROL** during the melting and pouring stages.
4. **GREAT EASE AND SIMPLICITY IN HANDLING ALLOYS** that were once considered sensitive and difficult to melt.
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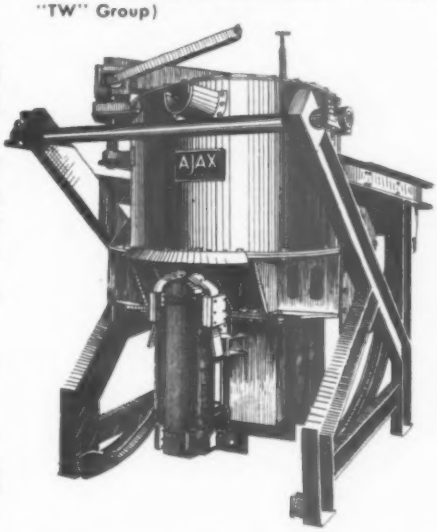
7. **DELIVERY** of the rated production per hour on the hour, (production capacity 300 lbs. to 1250 lbs. per hour).

This is the first commercial electric furnace for melting aluminum alloys in continuous operation. It utilizes the famous Ajax-Wyatt low-frequency induction melting principle which has been applied successfully for nearly all wrought brass melted throughout the world. Write for new bulletins . . . (The "TW" Group)



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Central Indiana

NATHAN JANCO, Centrifugal Casting Machine Co., Tulsa, Okla., was the principal speaker at the Dec. 6 meeting of the Central Indiana Chapter of the A. F. A., held at the Washington Hotel, Indianapolis, with an attendance of 94 members and guests. Discussing centrifugal casting methods, Mr. Janco illustrated the adaptability of the process to the production of both ferrous and nonferrous castings. He explained the various types of centrifugal processes, including true centrifugal, semi-centrifugal and pressure or centrifuse, and commented on the physical properties and yield obtained in this type of casting.

The chapter's annual holiday party was held Jan. 8 at the Atheneaum. Dinner, entertainment and a general good time comprised the program.—*Robert Langsenkamp, secretary.*

Southern California

ANOTHER attendance record for the Southern California Chapter of the A.F.A. was broken at the Nov. 19 meeting, when more than 230 members and guests gathered to hear two instructive talks. Earl Shoemaker, Kay Brunner Steel Products Co., discussed "Patterns—Past, Present and Future," and Comm. J. C. Arnold, U. S. Navy, spoke on inspection and testing of castings.

Other men present from the Los Angeles office of the Inspector of Naval Material included Lieut. Comm. Frome, Lieut. Comm. Willis, Lieut. Johnson, Lieut. Murray, Lieut. Schwartz, Paul Brown, Clarence Ake and Ben Clemens. Interesting movies of recent war activities in the Pacific and European theaters were shown illustrating actual use of castings in warfare.—*Blaine O. Bender.*

Chicago

ROUNDTABLE type programs continue their appeal to members of the Chicago Chapter of the A.F.A. A good turnout was present for the year's second such meeting on Jan. 3 at the Chicago Bar Association, and a large proportion of those sitting in at the three group sessions contributed to the discussion.

Steel division took "Substitute Materials" as its topic, with L. H. Hahn, metallurgist, Sivyer Steel Casting Co., as chairman, and Clyde Wyman, chief metallurgist, Burnside Steel Casting Co., as discussion leader.

"Uses and Abuses of Nonferrous Foundry Sands" was the subject taken by the Nonferrous division. Chester K. Faunt, Christensen & Olsen Foundry Co., served as chairman, and W. B. George, foundry engineer, R. Lavin & Sons Inc., led discussion.

Gray Iron and Pattern divisions combined their interests to discuss "Patterns

and Patterns Equipment." James T. Leisk, metallurgist, Chicago Hardware Foundry Co., North Chicago, Ill., was chairman, and Martin Rintz, superintendent, Continental Roll & Steel Foundry Co., East Chicago, Ind., and Edward B. Sabey, pattern superintendent, Miehle Printing Press & Mfg. Co., served jointly as discussion leaders.

In the Steel group an effort was made to develop discussion on NE (National Emergency) steels, but without any degree of success. Apparently these steel analyses are not employed widely in castings. The reason apparently is that NE steels, which conserve critical alloys, were developed primarily to give good hardenability which requires liquid quench. To the foundryman, liquid quench brings up the troublesome problem of distortion and the necessity for straightening.

The need for conserving foundry sand brought up the question as to whether it is economical to wash and re-use sand. One speaker pointed out that several large steel foundries have washing installations which are operating to give worthwhile economies. In such installations, the sand is cleaned by scrubbing action, only the fines are lost, foreign material is removed and core rods are salvaged, the sand is reclassified and discharged with a uniform 2 per cent moisture content. Reclaimed sand is used as new sand and is preferable to the latter because of the known moisture content. It was pointed out further that the country's sand resources are exhaustible, thus reclamation of used sand provides conservation. The foundry also saves money in purchases of new sand, shipping costs and disposal costs of old sand.

The Feb. 7 meeting of the chapter will be addresed by J. H. Van Deventer, president and editor of *Iron Age*, on the subject of "The Future of the Castings Industry."

On Jan. 12 the chapter opened the third year of its four-year educational program. This course deals with "Refractories and Molding and Coremaking." Details follow: Jan. 12—"Refractories," by R. A. Witchey, A. P. Green Firebrick Co.; Jan. 26—"Molding Methods," by A. W. Gregg, foundry engineer, Whiting Corp.; Feb. 9—"Molding Materials," by L. A. Hahn, metallurgist, Sivyer Steel Casting Co.; Feb. 23—"Coremaking Methods," by H. K. Briggs, sales metallurgist, Miller & Co.; March 8—"Coremaking Materials," by R. W. Schroeder, instructor, Washburne Trade School; and March 22—Inspection tour of the foundry divisions of Illinois Institute of Technology.—*Erle F. Ross*

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Tannewitz METAL CUTTING BAND SAWS

Variable Speed Models to fit Every Need

In addition to our regular High Speed Band Saws delivering over 2 miles of smooth vibrationless saw travel per minute, which have proved so exceedingly popular in automotive and aviation work, the TANNEWITZ line now offers five other models to provide the fastest cutting medium for every foundry need: a 30" machine available in any 3:1 speed variation from 100:300 or 1000:3000 blade feet per minute—a similar machine with 3-step V-belt drive to give 2300, 3100, 4000 blade feet per minute—a 36" machine with 32" capacity under the guide—a model with 48" wheels and one with 52" wheels, operating at 3,000 blade feet per minute for handling extra large castings. Get a line on the TANNEWITZ metal cutting band saw that fits your particular needs. It will save time, step up production and repay its cost dozens of times. Write for full particulars NOW!

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Western Michigan

THE third annual Christmas party of the Western Michigan Chapter of the A. F. A. was held at the Rowe Hotel, Grand Rapids, Mich., Dec. 10, with 134 members and their wives present. Under the direction of J. L. Brooks, chairman, and his committee of C. P. Ziegler and Fred McCarthy, a fine evening of entertainment was arranged. A turkey dinner was followed by an excellent three-act floor show. Dancing and the drawing for door prizes completed the evening's entertainment. Among the guests was Bob Kennedy, A. F. A. secretary, who spoke briefly regarding the national Foundry Congress to be held in Buffalo in April.—*K. C. McCready.*

Cincinnati

FIFTH annual Christmas party of the Cincinnati Chapter of the A.F.A. was held at the Netherland Plaza Hotel Dec. 11 with an attendance of approximately 500. A turkey dinner, dancing, a fine floor show and more dancing made up what was generally agreed to have been one of the best parties the chapter has held.—*Martin F. Milligan, secretary.*

Issues Yearbook

American Society for Testing Materials, 260 South Broad street, Philadelphia, has issued its 1943 edition of the *A.S.T.M. Yearbook*. The book contains 364 pages and includes a list of members and a roster of the various standing committees of the society.

TESTS GRAPHITE RODS IN STEEL FOUNDRY

(*Continued from page* 129)

Fahr. to offset natural cooling.

A series of tests were run to determine if the riser cavity was affected by a venting action by reason of the permeability of the graphite rod. Instead of setting the rod in the mold, whereby both ends are in contact with the porous mold sand, the special graphite rod was suspended within the riser on small tungsten pins, as shown in Fig. 10, which is self-explanatory. Different diameters and lengths of graphite rods were used, but for both cases the weight (0.11-pound) of graphite was the same. The results of the tests are shown in Fig. 12. As indicated, there is some difference in depth of shrink cavity, but the travel of carbon pickup from the rod was almost identical for both cases, providing that venting through the rods is not essential, at least for a semiblind riser (nonfreezing pop-off).

All these indicated results by themselves are interesting but valueless unless backed up by more pertinent facts. However, Lebanon Steel Foundry has accumulated the facts to establish the value of the experiments.

Yield Increased

When operating, prior to the adoption of the carbon rods in semiblind risers, plant yield was 43 to 45 per cent. When graphite rods were adopted it increased again to 53 to 54 per cent, a notable increase over the original result.

It is to be expected that when any new idea is tried out in a foundry, or for that matter anywhere, the results obtained will differ widely depending upon many circumstances. Some of the foundries that tried the rods experimentally were so successful that they are changing patterns as rapidly as possible so as to use the rods generally. Others concluded that the results secured did not warrant testing, but it is felt that in those cases there were extenuating conditions responsible for the lack of success.

Some examples of results of one large foundry which serve to confirm those at Lebanon Steel Foundry should be of interest. One casting that formerly required 24 tons of steel now uses 20 tons. By correct use of the graphite rods the size of the eight 16 x 18 x 52-inch high risers have been reduced to 16 x 18 x 13 inches high. In another case by using a 1-inch diameter rod one riser 23 inches high gives the same results as formerly obtained when using two risers 14 feet high. Another interesting example is one where the height of a 3-inch diameter riser has been reduced from 12 inches to 5 inches while in another case by using the graphite rods 9 castings per ton of steel are now obtained, instead of 6 as formerly.

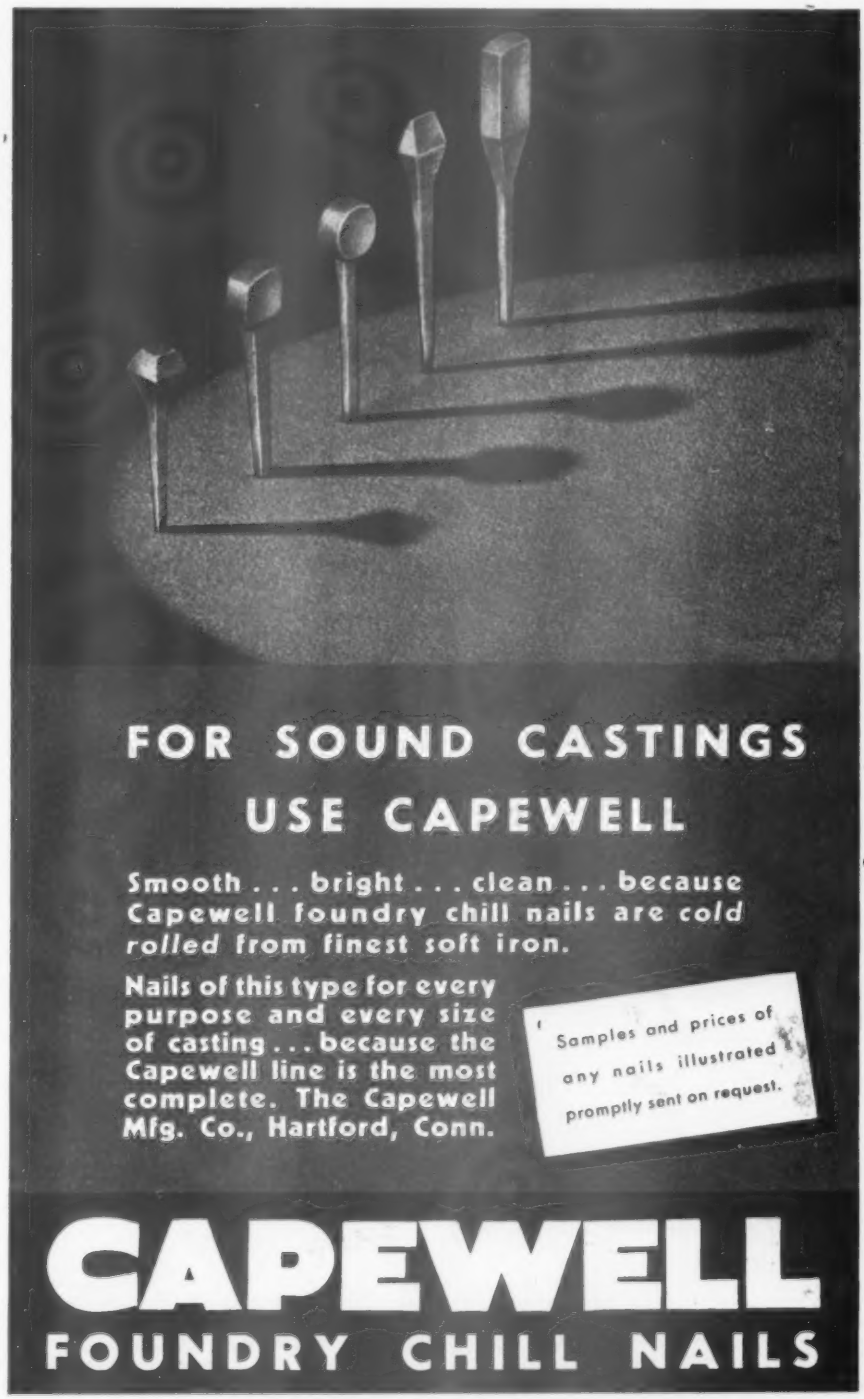
Such results do not come from indiscriminate application to every casting but from carefully studied use on castings where gains in yield can be foreseen.

Lebanon Steel Foundry has followed its own results with care and has established the sizes of rods to be used with the various sizes of risers required by its practice, as follows:

Riser, inches	Diameter—Graphite rod, inch
3— 5	1/4
5— 8	5/16
8—12	3/8

The advantages of the use of graphite rods in semiblind risers instead of core sand rods can be summed up as follows:

1. Shrink cavity is flat bottomed instead of carrot shape so shorter risers may be used.
2. Absorbed carbon lowers the melting point of the riser metal, increasing its fluidity so that it flows more freely.
3. Combustion of some of the graphite rod increases the temperature of the metal, adding to its fluidity.
4. Because the riser metal is of higher temperature and more fluid than that of the casting and since atmospheric pressure may enter through the riser flow-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Smooth . . . bright . . . clean . . . because Capewell foundry chill nails are cold rolled from finest soft iron.
Nails of this type for every purpose and every size of casting . . . because the Capewell line is the most complete. The Capewell Mfg. Co., Hartford, Conn.
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CAPEWELL
FOUNDRY CHILL NAILS

off or through the holes on opposite sides of the riser as the rods burn out, a head of liquid metal under atmospheric pressure is available for a longer casting feeding time than by other known methods.

5. Because the metal is hotter and more fluid the cross sectional area of the runners may be reduced, thus reducing cutting and grinding costs.

6. The graphite rods can be bought in a range of sizes to fit different conditions. They are handy to use and when bought in quantity are no more expensive than sand rods, besides being less fragile.

The authors wish to thank the management of Lebanon Steel Foundry for its co-operation in studying this interesting problem, and particularly H. D. Phillips, plant manager, F. J. Stanley, foundry superintendent, J. W. Juppenlatz, chief metallurgist, and L. W. Diran, metallurgist. J. Williams of the Dodge Steel Co. has patented the use of core sand rods in blind risers. It will be evident from the foregoing description that procedures investigated by H. D. Phillips differ in several notable respects from those described by Mr. Williams.

Crown Iron Works Co., Minneapolis, was awarded the Army-Navy "E" at ceremonies held Jan. 14.

FOUNDRY OVEN headquarters
FOR CASTING CONDITIONING EQUIPMENT
With the growing practice of heat conditioning castings to increase their strength or otherwise improve their characteristics, greater interest is being manifested in Lanly Ovens for these purposes.
Lanly experience embraces a practical knowledge of these operations which has been demonstrated in the designing of ovens and furnaces for processing cast iron, magnesium and aluminum castings.
Literature is available and correspondence is invited regarding equipment for performing these operations.
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WRITE FOR CATALOGS
Many leading foundries throughout the country rely upon Lanly for their core and mold drying and baking equipment. An impressive record of repeat orders is evidence of their high efficiency and large output capacity.
Available in various sizes are: rack type and car type ovens, lift door ovens, shelf type ovens and compact drawer type ovens.
Write for our special catalog of foundry ovens and let us discuss any immediate or contemplated needs that may confront you.
Heated by Gas, Oil, Electricity or Steam
THE LANLY CO.
OVENS FOR INDUSTRY
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CLEVELAND, O.

FOUNDRY MAKES VARIETY OF CASTINGS

(*Continued from page* 126)

molding machines and conveyor lines have been installed for the mass production of small castings after the manner practiced in foundries which specialize in a limited number of items. Castings are cleaned, chipped and ground in a large space extending across all four bays at the south end of the building.

Considering the departments more in detail, the three 25-ton, basic lined, oil fired stationary type open-hearth furnaces are elevated a sufficient height above the floor to eliminate any necessity for a ladle pit under the tapping spout. Raw materials for the furnaces are lifted by a yard crane and placed in the usual type charging boxes mounted on buggies operating on a track on the floor in front of the furnaces.

Use Mechanical Equipment

Incidentally—and merely as an illustration of the loose and random manner in which terms are used in the foundry industry—it is interesting to note that with a cupola in a gray iron foundry the charging platform and charging door are at the back and the tapping spout is in the front. The tapping spout on an open-hearth furnace where steel is melted is in the same relative position as the spout on a cupola, so far as filling the ladle and removal of the metal are concerned, but when men work around the spout, they are said to be working at the back of the furnace. The other side with the charging doors and charging floor is known by every open-hearth employe as the front side. From a logical standpoint the steel nomenclature would appear to be the more accurate and appropriate.

While a considerable degree of skill and knowledge are essential on the part of the men who operate the open-hearth furnaces, most of the old-time heavy and laborious work, with the exception of making and repairing bottom of the furnace after each heat, now is done by mechanical equipment. An electrically-operated charging machine travels back and forth on the floor in front of the furnaces. A ram on the charging machine engages the end of a charging box, lifts the box from the buggy, inserts it in the furnace, empties the box by rolling it over, and then withdraws the box and places it upon the buggy. By utilizing three doors the charge is spread over the entire furnace hearth. Furnace doors are opened and closed pneumatically. Reversing valves, which direct the flame alternately from either end of the furnace, are controlled and actuated mechanically and automatically. Recording instruments on a panel on the opposite side of the charging platform from the furnaces, indicate through dials the

fuel oil pressure and volume and the temperature of the bath.

The melter, equipped with a pair of blue glasses and peering through the peep hole in the door, keeps a sharp and experienced eye on the interior of the furnace to note the progress of the heat and the condition of the roof and walls. Active life of the furnace is largely contingent on this factor since up to the present no mechanical device has been developed to take the place of the highly trained eye of the melter, which enables him to detect and adjust minor irregularities, to bring out heats on time and maintain the life of the furnace to a maximum extent.

A species of sixth sense gained only through extended experience and close observation enables the melter to decide from a spoon test whether or not the metal in the bath is in proper condition to be tapped into the ladle. He judges the fluidity by the surface appearance and by the ease and speed with which the metal flows from the spoon into a test box or spreads on the floor. He breaks the test block to examine the fracture and usually can estimate the carbon content to within 5 points. A similar form of knowledge is acquired by gray iron foundrymen who estimate certain physical properties in the proposed casting by noting the fracture on a small test block poured against a chill. Adopted to a considerable extent in gray iron foundries only in recent years, the method always has been known and practiced in cast iron wheel and roll shops.

Perform Routine Tests

The melter's judgment is checked in a large and well-equipped laboratory where drillings from the test block are put through the usual routine tests to determine the content of the various elements to meet regular and special specifications. The laboratory is well staffed and equipped to carry on development, experimental and control work on metals, sands and incoming raw materials necessary to the production of steel castings.

Molds for the largest castings are made in concrete walled pits fitted with anchor bolts for securing the binder bars which extend over and across the tops of the assembled molds. In some instances a pattern is employed and the molds are made in the usual manner, but in the majority of instances a number of dry sand cores are assembled to form the complete mold. Most of the work is done in the drawing office, the pattern shop and in the coremaking department. Every large casting presents an individual problem because these huge objects are not ordered in quantity lots. Elaborate pattern and other equipment, quite proper where mass production is involved, are not included as major factors in the plan where only one casting is required.

Two main factors receive the most serious consideration. The first is development of a method that, so far as possible, will anticipate all hazards and will result in the production of a satisfactory casting. The second factor is based on the necessity of doing the work at minimum cost—and especially under present conditions—in minimum time. With an avalanche of orders flooding the books, with customers clamoring for priorities, with molding and melting capacities pushed to capacity day and night, the problem of allocating floor space occasionally turns the management's mind to the efforts of the late M'sieu Cristo trying to wriggle his way out of the Chateau D'If.

The problem does not apply to the other bays in the foundry where small and medium size molds are made continuously on jolt machines, set out on the floor, poured every time the 25-ton bottom pour ladle comes around, and shaken out. The flasks and sand are used over and over again. While still red hot, the castings are carried to the cleaning department at one end of the building where cores and any adhering sand on the outside are removed before the castings are given either an ordinary anneal at 1650 degrees Fahr. or special heat treatment depending on the composition of the metal. All annealing ovens are fired with oil. After the annealing or heat treatment the gates and sinkheads are cut off with a torch and then the castings are chipped, ground, weighed and shipped to their various destinations.

Large, heavy castings cannot be han-

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• To meet the demand for a uniform, "foolproof," easily prepared core wash, we offer CORDIP—a prepared powder complete with binder. Only water need be added to CORDIP to make a ready for use core-wash for dipping or spraying dry or green sand cores. Once the correct consistency (as measured by an hydrometer) is determined, it is an easy matter to always reproduce *exactly* the same wash. With present day high metal temperatures and close tolerances, a wash that is extremely dependable is definitely necessary. All guesswork, extra binders and extra mixing labors are eliminated.

CORDIP is manufactured in various grades to fit the entire field of core manufacture. It not only applies quickly and easily, but *turns* the iron to produce smooth, clean castings, thereby reducing scrap and cutting cleaning costs.

Tell us the type of work you do and the kind and size of cores you use and let us recommend the grade of core wash best adapted to your practice.

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to reduce chill and hardness
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SAGINAW, MICHIGAN, U.S.A.

dled in this summary manner. After the metal has solidified, the binder bars, rails and supplementary rigging are removed from the top of the mold. Wherever necessary the casting is stripped to facilitate contraction. Nuts are slacked off. Wedges are released and bars or pieces of plate are removed at strategic places. No further action is taken for one, two, or several days, depending on the thickness of metal section. Obviously a casting of thin section will cool more rapidly than a casting of equal length and width, but of greater thickness. When the casting has cooled to a temperature of approximately 400 degrees it is lifted from the pit and stripped of the cores by which it is surrounded. It is then lowered into a large annealing furnace in which the roof is made up of portable bungs. Immediately all the loose sand is removed from the pit and the bottom is made ready for the reception of another core assembly.

For some molds the cores are assembled on a sand bed, but in other instances the cores are placed on rigid foundation plates planed to a true and level surface. The plate for the Francis type turbine is split in two and is marked on the face with radial and circumferential lines to serve as guides in setting the cores. Each body core forms the inside of one vane and the outside of the adjoining vane. All wheels are alike in general design, but individual wheels vary to a considerable extent in size and in the degree to which the vanes lean from a vertical direction. Shape and position of the vanes determine the horsepower developed under a given head of water. Accurate spacing of the vanes is essential to the smooth and balanced operation of the unit when in service.

Since the cores forming the vanes overlap each other, the last core in the ring cannot be lowered into place by the crane. One half set of cores is built up on each half plate, while the plates are separated a suitable distance. Jack screws are then applied to one half of the plate and it is pushed into close contact with the other half, thus bringing the entire set of cores into proper position. Wheels of this type range in weight up to 70,000 pounds.

Air Dry Molds

While small castings are made in green sand molds and large molds for a wide range of miscellaneous castings are dried, a considerable number of castings in weight between 100 and 3000 pounds, are made in air dried molds. The molds are made, gated and headed in the usual manner, coated with silica wash and then are allowed to stand open for an average period of 24 hours. During that period practically all the moisture has evaporated and to the touch the face of the mold is almost as hard and as firm as the face of a mold dried in the oven.

As with many items of practice in the steel foundry, the air dried mold is a kind of hybrid, a product of necessity and ingenuity. Demand for increased tonnage exceeded the capacity of the drying ovens. Ingenuity, resourcefulness, past experience and the spirit of progress which animates all true foundrymen resulted in the birth and development of the air dried mold. The extra floor space required for the open molds over a 24-hour period is compensated for the greater amount of oven space available for molds that have to be baked or dried at high temperature.

A typical batch of facing sand for air dried molds contains 770 quarts of silica sand, grain fineness 50 to 60 with 75 per cent retained on three screens; 20 quarts of bentonite; 8 quarts of cereal binder; 6 quarts of silica flour; 6 quarts of silica clay. Moisture is 3.5 to 4.00 per cent; green permeability 138 to 163; minimum dry 173. Green strength compression is 3.00 to 3.5 pounds per square inch. Dry tensile strength, minimum at room temperature, 25 pounds. Sinters at 2450 degrees Fahr. in natural state and at 2650 washed.

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Coldwater, Mich..The Foundries Materials Co.	Oakland, Cal.....Industrial Supply Co.
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Enlarges Factory

Claud S. Gordon Co., Chicago, is doubling the space of its Cleveland office and factory with new quarters at 7016 Euclid Avenue. C. O. Anderson is Cleveland manager.

MALLEABLE FOUNDRY MAKES STEEL CASTINGS

(*Continued from page* 121)

high through which air is drawn by exhaust fans at the top at the rate of 8000 cubic feet per minute. The air movement not only aids in cooling the sand, but also effectively removes the fines from the sand. Some water also is sprayed into the hot sand in the drum to produce an evaporative cooling effect. The shakeout sand, after passing through the cooling drum, is about 100 degrees Fahr. and contains around 0.3 per cent moisture. This sand falls on a conveyor belt which carries it over a magnetic pulley.

The sand then drops into the boot of an elevating, bucket type conveyor which raises it to a storage hopper located at the top of a structure adjoining the tower previously mentioned.

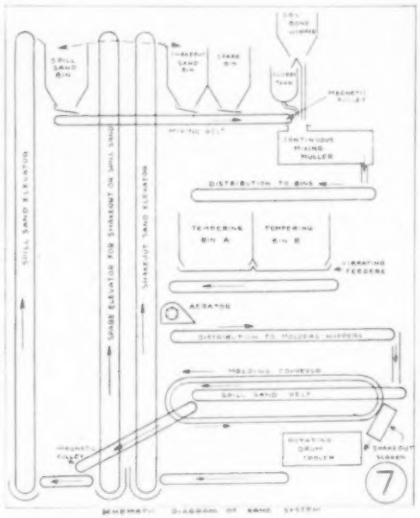

Fig. 7—Schematic diagram showing arrangement of sand handling system

Spill sand from the molding machines and excess molding sand from the distributing system falls on the underground conveyor belt and is carried to a bucket type conveyor which elevates it to a storage hopper close to that containing the shakeout sand. The spill sand contains about 2.0 per cent moisture. A cross belt passing under both hoppers conveys the sands to a continuous mixing muller. While the amount of each sand used will depend upon the type of castings to be made, and the quantity of each sand available, the ratio of spill to shakeout sand in general is 1 to 1. Just before the sand enters the continuous mulling unit, bentonite in the dry form and as a slurry is added, and the sand passes over a magnetic pulley. After mixing, the sand drops on another cross belt which transports it to two tempering storage bins of 150 tons capacity each. Each bin carries 130 tons in storage and the system handles 150 tons of sand per hour. The bins are equipped with vibrating gates or feeders which feed the sand onto a belt passing under the two bins. From that belt the sand falls into an aerator and then on the distributing belt which carries the sand to the molding station hoppers.

After the castings are shaken out, they are hooked on a hook-type, endless chain conveyor 940 feet long. The cooling section 700 feet long is located outside the building, and allows 37 to 38 minutes cooling. The casting conveyor re-entering the building travels over an elevated platform about 12 feet above the floor. The platform is located above sloping bottom bins. Castings are removed from the conveyor hooks and put on a roller conveyor which carries them through an abrasive blast unit. Then they are placed on specially designed burning fixtures which cut off the gates and risers automatically. Cutting flame is composed of natural gas and oxygen. The gates and risers drop into one compartment of the bin from which they are raked into the dump boxes to be charged into the electric furnaces. The castings drop into another compartment of the bin and then into tote boxes for transfer to chipping and grinding operations which are performed prior to heat treatment.

DAYTON WHEELS for PORTABLE GRINDERS

Many of America's most progressive foundries are meeting today's demands for an ever increasing tonnage through a wider use of portable grinders. Frequently, this calls for "common-sense" changes in their portable grinding wheels—changes which may involve new sizes . . . new shapes . . . different grains . . . different grades.

Dayton Portable Grinding Wheels—especially engineered to meet TODAY'S NEEDS—are bringing smiles to the faces of production men in scores of foundries throughout the land. Why not let one of our "know how" engineers put his experience to work for you!

SIMONDS WORDEN WHITE CO.
710 NEGLEY PLACE
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DAYTON GRINDING WHEELS

The heat treating procedure comprises normalizing, reheating for oil quenching, and drawing.

The normalizing treatment at 1750 degrees Fahr. is given in twin furnaces direct-fired with automatic controls. Each of these furnaces contains two rows of 24 x 36 inch heat-resisting trays, 13 to the row. These trays loaded with castings are pushed at 32-minute intervals, the complete normalizing cycle taking slightly less than 7 hours. Castings coming out of the normalizers cool in the trays in still air before being pushed into the reheat furnace.

The reheat furnace is also a continuous type furnace using the same type tray as the normalizers. This furnace is heated by gas-fired radiant tubes. It is 12 feet wide and 115 feet long. The temperatures in the 11 zones of this furnace are controlled automatically. Trays of normalized castings are pushed into it at 16-minute intervals, and since the furnace contains 46 trays the total cycle requires 12.3 hours. That period is divided into approximately 9 hours for bringing up to the holding temperature of 1550 degrees Fahr., and 3 hours at that temperature. On emergence from the furnace, the castings at 1550 degrees Fahr. are dumped into a large container submerged in an oil bath. After a short period in the quenching medium, the container with the castings is raised a short distance from the bath to permit the oil to drain off, and then elevated above a dump hopper where it is inclined at an angle of 45 degrees, at which point the side of the container is opened to release the castings. Temperature of the oil bath is controlled by external water coolers. The castings then are placed on trays and pushed through recirculating air-type, draw furnaces. Each of these furnaces has two external heaters which supply heat to the two automatically controlled zones. There are two rows of trays, 20 to the row, and since the pushing interval is 24 minutes, the total cycle takes 8 hours. Approximately 4 hours of this time the castings are at the drawing temperature (1170-1280 degrees depending upon the class of steel). Castings from the draw furnaces are sampled at regular intervals and brinell tested to insure good control of the hardness.

Following heat treatment the castings are cleaned by abrasive blasting and then subjected to a careful inspection. Some of the castings are gaged 100 per cent for size, and from time to time castings taken from the line are sectioned by abrasive sawing and deep-etched to insure that production phases are functioning properly and no flaws are present. Previous to placing a casting into the production run, gamma ray radiographs are taken of castings with different types of gates and risers to determine the particular arrangement which produces sound, dense castings. At various intervals radiographic checks are made to insure proper procedure. Also, microscopic examinations are made daily on heat treated castings from the production line to see that the desired structure is being obtained.

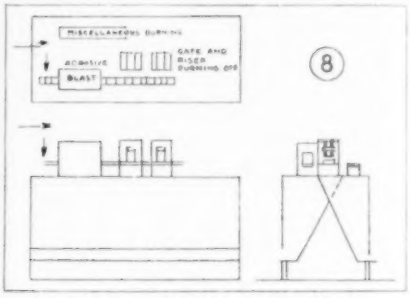

Fig. 8—Sketch showing the arrangement for cutting off gates and risers on elevated platform over bins

Two castings made at Saginaw Malleable require surface hardening on three faces. To accomplish that, the firm's engineers developed an automatic machine which employs natural gas and air as the heating fuel. The flame mixture is composed of 10 parts air and 1 part natural gas by volume under a pressure of 3 pounds per square inch. The castings are heated for 1 minute and then quenched immediately in water. One machine handles about 1300 castings per day, and each operator runs two machines.

Uniformity

AT 500° F. — 1200° F. — 1800° F.

DEMPSEY FURNACE

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INDUSTRIAL

FURNACES

FOR ALL HEAT TREATING NEEDS... LARGE OR SMALL

Over- and under-firing, as used by Dempsey in Car Type Furnaces, eliminates the "cold center" so inherent in the plain direct-fired furnace. In addition, it supplies faster heat, saves time and produces excellent uniformity. Illustrating the range of operations for which they are suitable is a single unit now being used for production at temperatures as low as 500°F., at 1200°F. and also giving good uniformity at 1800°F. (name on request). Write for bulletin showing range of standard sizes.

The Dempsey staff of heating engineers is at your service at any time. Without obligation, they will be glad to consult with you and make recommendations based upon your own heat treating problems.

DEMPSEY FURNACES PRODUCING FOR INDUSTRY

American Bosch Corporation · Bryant Chucking Grinder Co. · Chapman Valve Mfg. Co. · General Drop Forge Div. Brown-Lipe Gear Co. · General Electric Co. · Jones and Lamson Machine Co. · Phelps Dodge Corp. · Westinghouse Electric & Mfg. Co. · Worthington Pump & Machinery Co.

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Combined 50 years' experience building Dempsey and Gilbert & Barker Furnaces for all heat treating needs

SPRINGFIELD • MASSACHUSETTS

MELTING AND POURING MAGNESIUM

(*Continued from page* 124)

by the molten magnesium alloy with an increase in the silicon content. Reasonable care in foundry operations will prevent this pick-up going beyond the specification limits of 0.3 per cent. A good foundry will hold the silicon below 0.2 per cent on almost all metal.

Scrap which has become damp always should be dried out thoroughly before being placed in the melting crucible. If the moisture content is large, a blow may result when a damp casting is placed in the crucible. Even a small amount of moisture is dangerous because it may cause gassed metal. Hydrocarbon oils on metal being melted also may cause gassed metal.

When filling the casting crucibles from the premelt crucibles, enough of a crucible type flux should be used in the casting crucible to control burning. It is essential that large quantities of thin flux from the premelt crucible should not be allowed to flow into the casting crucible when transferring the molten metal. After the casting crucible has been filled and transferred to the superheating furnace, the metal must be stirred thoroughly to clean the metal properly. During this operation the surface of the metal should be covered well with a layer of the crucible flux. Stirring usually is done with a bent iron rod approximately ¾-inch in diameter. The rod is moved in the metal in such a way as to mix the flux through the metal and impart a rotary motion to the metal.

Suggests Mechanical Stirring

Use of mechanical stirring devices seems to offer advantages over hand stirring. It eliminates a disagreeable and rather difficult job and therefore makes it more likely that the stirring will be done properly and uniformly. After the stirring operations it is good practice to remove the dross and excess flux from the surface by means of a skimmer. If the metal does not have a bright silvery appearance during the latter part of the stirring operation, it is well to reflux and restir. This usually is not necessary. After the stirring and cleaning operation, the metal is covered with a thin layer of the crucible flux and the thermocouple inserted. Care must be taken at this point to see that a uniform and continuous flux cover is placed on the metal. If this is not done, the metal may start to burn during the superheating operation and cause trouble.

The grain size of the cast metal is refined and the mechanical properties improved by superheating. The superheating practice varies somewhat in different foundries. In general, about 15 minutes at a temperature of 1650 degrees Fahr. or heating to 1700 degrees Fahr. gives good superheat effect. For best results the crucible should be removed from the furnace at a temperature of about 1650 degrees Fahr. and cooled in air to the casting temperature. Slow cooling to casting temperature in the furnace causes part of the grain refining effect to be lost.

Just before time to pour the casting, the flux and oxide skin on the top of the metal must be either removed completely from the crucible or pushed back from the pouring lip in such a way that there is no danger of the flux-oxide mixture flowing with the metal into the mold. During the interval between the removal of the flux-oxide layer and the pouring of the casting, burning in the crucible is controlled by a sulphur containing agent. This may be either a simple mixture of sulphur and boric acid, or Dow agent No. 181. This protective material is dusted on the surface of the metal in such a way as to form a temporary protective skin, but it must not be used in such a manner as to become mixed with the metal stream. If this occurs, the agent will be carried down into the mold and cause gas bubbles which may scrap the casting.

It is desirable to place the crucible in a protecting shield during its transfer from the superheating furnace to the casting floor. This prevents too rapid

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cooling of the metal and also shields the operator from the direct heat of the crucible of molten metal.

Some foundries make a small addition of calcium to the metal. This is added by plunging a piece of pure calcium or a magnesium calcium alloy into the molten magnesium alloy when the latter is at a definite temperature interval above the casting temperature.

When the metal is ready to pour, the skin formed by the protective agent is pushed back with a skimmer and a light dusting of this agent again is placed on the molten metal. Then the crucible of metal is tilted and the metal poured into the pouring basin in such a way that the stream does not go directly down the sprue. The proper use of a pouring basin is absolutely necessary for the production of good quality magnesium alloy castings. There always is some oxidation of the stream of metal flowing into the pouring basin, and since the magnesium oxide is very nearly the same specific gravity as the magnesium alloy, it does not separate out from the metal unless a properly designed pouring basin is used. Dimensions of the pouring basin will vary with the size of crucible from which the mold is poured. The basin may be made of cast iron, a dry sand core, or green sand rammed up in a box. In any case the pouring basin must be long enough so that the stream of metal from the crucible will not go directly into the sprue.

Presence of flux inclusions in magnesium alloy castings is an indication of careless or uninformed workmen. Castings are being produced in regular foundry practice with practically no trouble from flux inclusions. There are two or three operations where flux inclusion can be formed if the proper practice is not used. These are as follows:

1. Placing of crucible flux on the metal at too short a time before pouring. The flux must be allowed to dry out to such a degree that it will not flow with the metal.

2. Use of the wrong flux, such as the No. 230 flux where No. 310 should be used.

3. Pouring all the metal from the crucible into the mold. If a heel of 3 or 4 inches is left in the crucible the chances of flux inclusion is decreased greatly.

4. The metal flowing over a surface on which flux is lying. If the lip of the crucible is improperly cleaned, the flux deposit will melt as the hot metal flows over.

Use Humidity Test

As a check on the incidence of flux inclusions in castings due to careless melting and pouring practice, it is recommended that a few castings from each pouring area be placed regularly in a humidity room for a period of about 48 hours. This room should be maintained at a temperature of 85 to 95 degrees Fahr. and have a relative humidity of about 90 per cent. This test will cause flux inclusions to show as a grayish-white bloom on the casting.

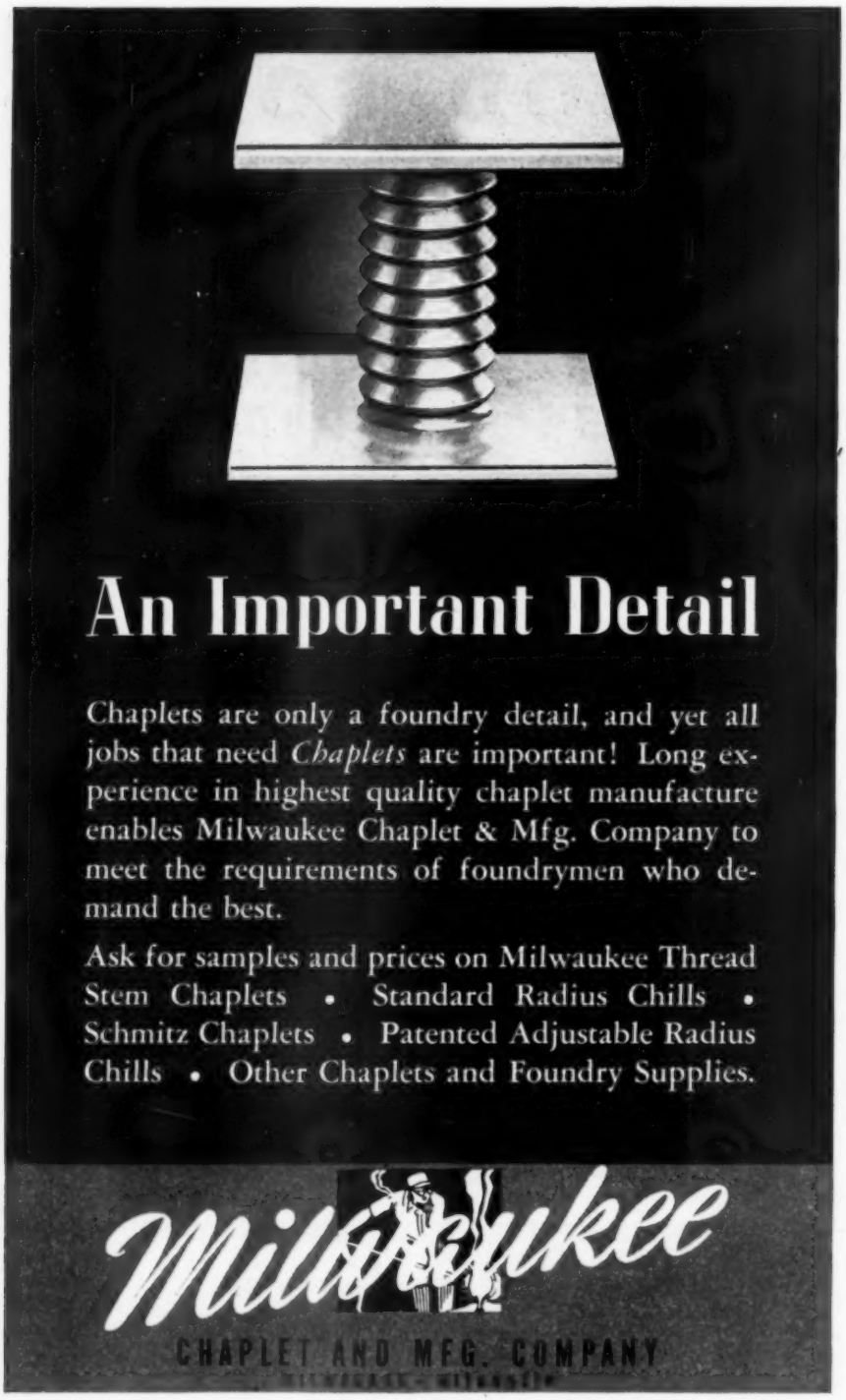
Since the flux used is hygroscopic, be very sure that all tools or material brought in contact with the molten metal are thoroughly dry. Flux containers should be kept covered.

Workmen handling molten metal should be required to wear protective clothing and face shields. Otherwise serious burns may result.

The proper pouring temperature for each casting can be determined by trial and should be that at which mis-runs are avoided and sound castings produced. The pouring range of castings in general runs from about 1400 to about 1600 degrees Fahr.

To Hold Meetings

American Society for Testing Materials has decided to hold its 1944 Spring Meeting and Committee Week in Cincinnati at the Netherland Plaza hotel during Feb. 28 to March 3. Technical feature of the meeting is to be a symposium on application and uses of synthetic rubber. The annual meeting of the society will be held at the Waldorf-Astoria hotel, New York, on June 26 to 30.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Ask for samples and prices on Milwaukee Thread Stem Chaplets • Standard Radius Chills • Schmitz Chaplets • Patented Adjustable Radius Chills • Other Chaplets and Foundry Supplies.
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HIGH PRODUCTION X-RAY

Unit Uses Handling System

By W. D. CRELLEY
General Electric X-Ray Corp.
Chicago

ONE of the biggest factors in the unprecedented increase in output of materials throughout the country is the part being played by industrial x-ray equipment operating at voltages ranging from 60,000 up to and including 1,000,000 volts. A large number of such units have been delivered or are in the process of production for a wide variety of industries, providing them with an inspection tool that is compact and safe, and enabling them to insure quality and to materially increase production of heavy objects.

One type of x-ray equipment, developed by the General Electric X-Ray Corp., Chicago, and particularly valuable in speeding war plant production,

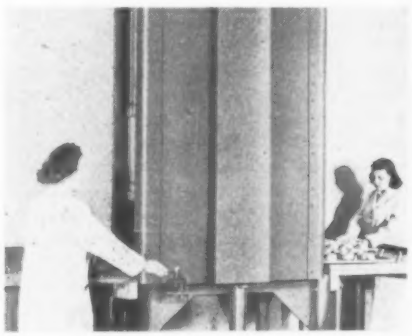

Fig. 1—Air valve being moved by operator at left actuates pneumatic-cylinder drives that open and close doors of x-ray cabinet quickly

is now semi-automatic, manually operated with lead-protected production housing and available in two types for use with equipment operating at voltages ranging from 140,000 to 250,000 volts.

Designed expressly to provide a rapid, accurate method for inspecting large production lots of light-alloy castings and assemblies, this new housing is relatively simple in its construction, and it replaces the fully automatic motor-driven production unit which is no longer available. The design and construction of the new housing is such that it uses an absolute minimum of such critical materials as electric motors, ball bearings, gears and other items without sacrificing either high quality or efficient, easy operation.

The unit consists of a lead-lined steel cabinet which houses the x-ray unit. Lead-lined doors are incorporated on opposite sides of the cabinet. The doors are counterbalanced by suitable counterweights which, in turn, are connected to an air cylinder that permits operation of the doors by a hand valve at the loading position. The doors are fitted with limit switches.

On either side of the lead-lined cabinet there are two ball bearing tables, each of which consists of 94 ball bearings set flush with the level of the roller conveyor in the cabinet. These tables extend the width of the lead-lined cabinet and are connected on the rear side of the cabinet with a return conveyor of the ball bearing roller type.

The unit is furnished with three lead-covered trays which should be sufficient to handle a normal amount of production work. These trays are 22 x 34 inches and will accommodate two 14 x 17-inch film holders.

The ball bearing tables, shown in the accompanying illustrations permit the direction-of-work movement to be from left to right or from right to left, depending upon the preference of the operators who are handling the trays.

The loading operator loads one or

From *Steel*, Oct. 25, 1943.

Getting a LIFT with a Stearns MAGNET

Assembling this 4000-lb. track would be a tough job without Stearns Lifting Magnets. This is only one of many applications for Stearns magnets that help speed production in busy war plants.

Moving large quantities of material in fast time at low cost—guarding hand labor on difficult and dangerous operations, conveniently, safely and economically.

Increasing storage capacities, loading and unloading are a few of the advantages of using Stearns Lifting Magnets.

Let Stearns magnets give you a lift. We make 'em in many sizes and shapes. Why not consult Stearns Magnetic Milwaukee with your problem.

Write for our Bulletin 35

STEARNS MAGNETIC MANUFACTURING CO.
662 S. 28th St., Milwaukee, Wis.

two negative holders on one of the three lead-covered trays. She then positions the parts to be inspected on the holders and identifies them with a suitable marking device or lead letters and numerals.

Having completed the loading, she operates the air valve which raises the two counterbalanced doors in the cabinet and manually pushes the loaded tray into the cabinet. After centering the trays in the guides, she again operates the air valve which lowers the doors. When the doors are completely closed, the limit switches start the x-ray exposure automatically.

While the x-ray exposure is in progress, the operator prepares the second tray with exposure holders and parts. Upon termination of the x-ray exposure, the operator raises the doors and shoves the exposed tray of castings out of the cabinet to the opposite side of the assembly where another operator stationed at the rear side of the unit then pulls the exposed tray to the "return" position.

The first operator proceeds to position the second tray. While the exposure is in progress, she loads the third tray as described above. Meanwhile the second operator unloads the exposed castings, places them on a storage rack and sends the exposed films to the dark room. She then returns the empty tray to the "loading side" of the assembly simply by sliding the tray across the ball bearing conveyor.

If many small parts are to be examined, additional operators can be stationed around the equipment so that the trays are merely shuttled from one operator to the next, each performing a specific duty such as unloading castings, unloading films, positioning negative holders, positioning castings, etc. There are actually six tray positions on the unit—one of which is occupied by the lead-lined cabinet—so that five operators can be employed efficiently if the quantity and type of parts to be examined would warrant using this number of operators.

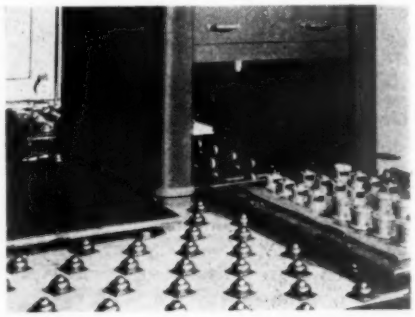

Fig. 2—Closeup of ball bearing tables which facilitate movement of trays which carry the negative holder and work to be examined as shown at right. Table extends around machine to left, returning the trays to loading side of machine

HAYNES

EQUIPMENT

WORM GEAR LADLES

Haynes Worm Gear Ladles are manufactured in all sizes. They are built to handle light or heavy production. Whatever your shop requirements are, you'll find a HAYNES Worm Gear Ladle available for every pouring need. Bowls are welded, and trunnions are cast steel with "V" bail. All gears are completely enclosed—and all moving parts are equipped with Zerk fittings. Bail is made from 3" x 1" steel. Send for detailed information and prices. In all cases, deliveries are promptly made.

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MOLDING MACHINES — CORE OVENS — BRASS FURNACES

Will Study Chill Test Methods

Recently organized Chill Test Committee of the Gray Iron Division of the A.F.A. met in Cleveland on Jan. 12 under Chairman Tom Barlow, Vanadium Corp. of America, Detroit, to plan its procedure for studying existing methods of making chill tests with the ultimate aim of standardizing the test if possible. Arrangements were made to have work carried on by a number of foundries on four types of chill test bars poured in green and dry sand under actual foundry production conditions to obtain all pertinent data. The investigation will begin shortly, and it is planned to present a progress report at one of the shop operation courses during the annual convention to be held in Buffalo during April 25 to 28.

Members of the committee in addition to Mr. Barlow include T. E. Egan, Cooper-Bessemer Corp., Grove City, Pa.; Kenneth Geist, Allis-Chalmers Mfg. Co., Milwaukee; Edward A. Janke, Nordberg Mfg. Co., Milwaukee; D. E. Krause, Battelle Memorial Institute, Columbus, O.; D. E. Lehane, Westinghouse Electric & Mfg. Co., Trafford, Pa.; William McFerrin, Cadillac Motor Car Co., Detroit, and H. C. Winte, Worthington Pump & Machinery Corp., Buffalo.

FOUNDRY ACTIVITIES

NATIONAL MAGNESIUM CASTING CO., a new subsidiary of National Foundry & Machine Co., St. Louis, is providing a $400,000 magnesium foundry under a contract from the Defense Plant Corp. The new plant is expected to be in operation in March and employ about 500 persons. DPC retains title to the plant. National Magnesium Casting Co. is headed by William L. Heckmann, president of the National Foundry & Machine Co., which will operate the new facilities in production of magnesium sand castings for the Army Air Corps.

* * *

Josiah Anstice & Co. Inc., 111 Humboldt Street, Rochester, N. Y., has changed its name to the Anstice Co. Inc. A well-known foundry producing gray iron, brass, bronze and aluminum castings, the company was established in 1884. It recently completed a plant expansion to provide increased capacity and variety of products.

* * *

France Foundry & Machine Co., 1215 West Bancroft street, Toledo, O., has changed its name to Alloy Founders Inc. and will continue at that location. Personnel, equipment, service and financial position of the company remains the same. D. G. Slee is president.

* * *

James B. Coggins, operating a nonferrous foundry at Meriden, Conn., has incorporated the business, which now is known as the J. B. Coggins Mfg. Co. Personnel and management are unchanged.

* * *

Sterling Aluminum Products Inc., St. Louis, has let contract to John Hill Construction Co., St. Louis, for a one-story, 150 x 300-foot addition to its plant, to cost about $300,000.

* * *

Allied Steel Castings Co., Harvey, Ill., has let contract to Aetna Engineering Works, Chicago, for a one-story, 120 x 300-foot addition to its heat treating building.

* * *

African Malleable Foundries Ltd. Benoni, Transvaal, South Africa, has made arrangements with the Meehanite Metal Corp., New Rochelle, N. Y., for the manufacture of meehanite castings.

* * *

American Alloy Foundry, which recently moved into larger quarters at 112 South Eden Street, Baltimore, is increasing and modernizing its equipment.

* * *

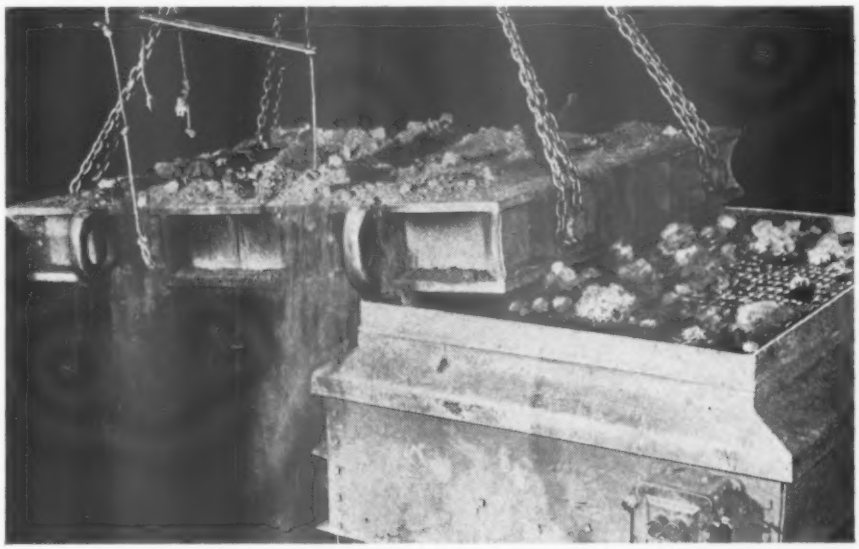
Maritime Brass & Bronze Works Inc., San Pedro, Calif., has acquired the entire interest in the Harbor Brass Foundry, Wilmington, Calif., which previously was owned and operated by Doyt G. Huston. The latter's plant is being operated in conjunction with Maritime's main plant at Harbor City, Calif. Maritime Brass & Bronze Works is headed by S. H. Robinson who, with J. A. Robinson, founded the company. The latter remains as secretary and treasurer as well as general manager and director of operations. Other officers now include Doyt G. Huston, vice president in charge of repair and emergency castings; Edward Haines, vice president in charge of sales and expediting; Victor Haines, vice president in charge of production.

* * *

El Monte Foundry Co. is erecting a 26 x 32 foot addition to its plant at 504 Orchard Street, El Monte, Calif.

* * *

Oregon Electric Steel Rolling Mills, Portland, Oreg., has been sold to K. B. Hall and A. M. Mears. Both are identified with Hesse Ersted Iron Works Inc., Portland—Mr. Hall as president



WE DON'T RECOMMEND DOING THIS

...but it proves that The Floatex Can Take It!

Every once in a while, a foundry finds it necessary to make an "outsize" casting—larger than the usual run . . . larger than any Shakeout in the plant. This poses the problem: how can that flask be shaken-out?

It's no problem at all when the Shakeout is a Robins Floatex—the picture proves it. The flask was 66"x 72"x10"; the deck of this Portable Floatex, 48"x72". Only one end of the flask was lowered onto the Shakeout. Yet, in just 3 minutes, the flask was completely emptied . . . without being damaged.

We don't recommend doing this—but the Robins Floatex can stand that kind of punishment. Because only the Floatex is genuinely full-floating. Only the Floatex carries the entire load—flask and vibrating deck—on heavy-duty coil springs . . . no eccentric shafts to snap, no rigidly-fixed main bearings to crack. Best of all, no vibration escaping into the supports; the Floatex shakes the flask —not the building.

Portable models to 17 tons capacity; Standard models for 1 ton to 100 tons or more. Robins Floatex Shakeouts save man-hours, save flask maintenance; often pay for themselves in a year or less. For further facts address Department F-2.

ROBINS *makes:* BELT CONVEYORS • COAL AND ORE BRIDGES • BUCKET ELEVATORS • CAR AND BARGE HAULS • CAR DUMPERS • CAR RETARDERS • CASTINGS • CHUTES • CONVEYOR IDLERS AND PULLEYS • CRUSHERS • FEEDERS • FOUNDRY SHAKEOUTS • GATES • GEARS • GRAB BUCKETS • PIVOTED BUCKET CONVEYORS • VIBRATING SCREENS • SCREEN CLOTH • SELF-UNLOADING BOAT MECHANISMS • SKIP HOISTS • STORAGE AND RECLAIMING MACHINES AND SYSTEMS • TAKEUPS • LOADING AND UNLOADING TOWERS • TRIPPERS • WEIGH LARRIES • WINCHES • WINDLASSES

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ROBINS CONVEYORS INCORPORATED

Founded in 1896 as Robins Conveying Belt Co.

PASSAIC • NEW JERSEY

MATERIALS HANDLING MACHINERY

and general manager and Mr. Mears as secretary-treasurer and works manager. Mr. Mears is president and general manager of the newly purchased steel plant. Also identified with the new owners is I. H. Kulp of the War Production Board and U. S. Maritime Commission, Washington, and formerly with Colorado Fuel & Iron Co., Denver.

• • •

General Malleable Corp. suffered an estimated $25,000 damage to one of the buildings of its Waukesha, Wis., plant as the result of fire on Dec. 12.

• • •

Lincoln Foundry Co., Lincoln, Nebr., experienced an estimated loss of $7500 by fire on Dec. 18 which destroyed the building and contents.

• • •

Galt Malleable Iron Co. Ltd., Galt, Ont., has let contract for construction of a one-story, 30 x 132-foot core building, to cost about $25,000.

• • •

Homestead Valve Mfg. Co., Coraopolis, Pa., has been awarded the second gold star to be added to its Maritime "M" pennant.

• • •

Arrow Aluminum Casting Co., 10301 Berea Road, Cleveland, plans construction of a 40 x 100-foot foundry building.

SIDESTEPPED BY OTHERS

LICKED by SAHARA!

NAME ON REQUEST

He installed 124 feet of 20" x 6-ply SAHARA on a shakeout conveyor carrying extremely hot sand—a job which was sidestepped by several belt manufacturers after investigating operating conditions. SAHARA gave 50 percent more service than previous competitive belts.

REXALL... FOR COLD SAND AND CASTINGS

IMPERIAL BELTING COMPANY

1750 S. Kilbourn, Chicago 23, Ill.

Holds Discussion on Industrial Hygiene

Nearly 550 attended the eighth annual meeting of the Industrial Hygiene Foundation held recently at Mellon Institute, Pittsburgh. Charles F. Kettering, General Motors Corp., delivered the keynote address pointing out that the better the working conditions, the better the point of view and the production. He also introduced a roundtable discussion on "Putting the Disabled Veteran Back to Work." That panel featured by presentation of case histories included the following participants:

Dr. C. D. Selby, General Motors Corp.; Col. John N. Andrews, National Selective Service System; Dr. Harley L. Krieger, Ford Motor Co.; A. A. Hendrix, Eastern Aircraft Division, and I. Dent Jenkins, Harrison Radiator Division, General Motors Corp. In the discussion it was brought out that more than 600,000 service men have been released, that the figure is increasing rapidly, and that most industries co-operate in re-employment of the returning veterans. Ford Motor Co. has already re-employed 348 veterans, many with physical handicaps of a minor or major character, and Eastern Aircraft had placed 375. Personnel men will have even a bigger job after the war in making adjustments to place servicemen successfully.

Medical section of the program followed over which Dr. R. R. Sayers, U. S. Bureau of Mines presided. Talks and papers included such subjects as "Recent Data on Health Hazards in War Industries," "Fluorides as an Industrial Health Problem," "Observations for a Number of Years of Lung Changes in a Group of Electric Arc Welders," and "Progress Report on a Foundation-supported Study of Disability in Silicotics."

Second day of the meeting opened with an industrial relations section presided over by E. E. Meyers, U. S. Steel Corp., at which Dr. C. O. Sappington summarized a plant-to-plant study which he has been conducting for the organization on "Health Problems of Women in Industry." The report will be published separately, Dr. E. J. Stieglitz described "Health Problems of the Older Employe and Employer," and called on industry to lead the way in utilizing older workers since our population is shifting to more persons in the older age groups. Findings from the Foundation-Public Health studies of sick absenteeism, in progress since 1941, were reported by Dr. W. M. Gafafer, U. S. Public Health Service.

The Engineering section followed with reports on findings from plant hygiene surveys conducted by the organization's staff, and discussions on numerous other phases. The Legal section concluded the program.

DeVilbiss Co., Toledo, O., has won for the second time the Army-Navy "E" to duplicate the award first received a year ago.

FACTORS IN MAKING QUALITY CASTINGS

(*Continued from page* 115)

sections. In designing sections that join in an "X", it is suggested that both arms be offset considerably.

Metal inserts should be knurled or grooved to insure mechanical bond, and sufficient metal must be provided around such inserts to eliminate cracks during solidification.

Wherever possible machine surfaces should be cast in the drag since there is less opportunity of these surfaces containing defects, such as shrinkage and blow-holes.

The best designed casting is the one in which all members progressively increase in thickness to one central location where a riser can be placed.

In the final analysis it should always be remembered that the cheapest design is the one which represents the least difficulties and risks in manufacture. This is particularly true in the production of quality and especially pressure castings. The final solution lies in a close co-operation between the designer and the foundryman and a better understanding of each other's problems.

Pattern Determines Quality

The method by which the pattern is made will often determine the ultimate quality of the castings. As a criterion the casting is never better than the pattern from which it is made. The false economy of makeshift and almost unusable patterns, the use of poor material, or so-called economical design of the pattern, are all realized by most foundry executives as being regular happenings. In repetition work this does not occur generally, because the ultimate value of the order permits a reasonable pattern cost. Here it is realized that uniformity, quality and rate of production give an adequate return. However, vast quantities of castings must be made which are not of a repetitive character, and yet very often higher standards are demanded for these jobbing castings—for example, steam pressure castings, turbine castings and similar castings.

Accuracy of shape, perfect soundness, and the precise placement of all cores, are matters of infinite importance, but still the design may alter considerably from order to order.

When the significance of all these points is realized one would imagine that patterns for such parts would be of the very best.

It must be borne in mind constantly that a pattern is used solely to make molds which finally produce the castings. Consequently, mold design should be considered before the pattern is made. In addition to forming the mold cavity the pattern must be provided with gates, and often risers to compensate for solidification contraction. Consequently, the location of the risers, and the facility of attaching as well as removing them, must be considered.

The pattern allowances required to produce the casting of proper size and shape depend partly on casting design, on shrinkage and contraction characteristics of the metal involved, and on many other factors. These factors cannot always be computed precisely, and a process of trial and error must be undertaken so that pattern dimensions can be adjusted to give castings of dimensions required by drawings.

These points are mentioned to emphasize that whole-hearted co-operation between the designer, patternmaker and the foundrymen is essential from the conception of the idea to the delivery of the casting as a finished product.

In general, patterns may be classified as follows: Single, loose, wood or metal patterns; gated, wood or metal patterns; metal match-plate patterns; wood, cope and drag patterns; or special pattern equipment.

Since hand molding is the most expensive method of manufacturing castings, patterns should not be classified for this type of molding unless production schedules or difficulties in molding process necessitate this particular step.

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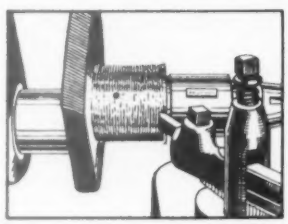

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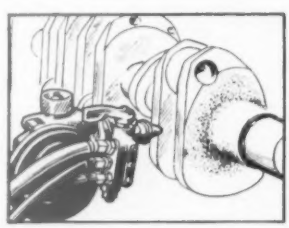

Sprayed journal before finishing—Main bearing journal after surface has been Metallized.

Y-101

Single, loose wood patterns are relatively cheap but should be used only for a very limited production. Such patterns warp easily and are damaged readily in handling. They are adaptable especially where an experimental piece of equipment which is subject to development is being built and where only one or two castings are required from a pattern. Certain types of jobs, even though ordered in small quantities, will yield more satisfactory castings and a final lower cost if the patterns are mounted; this is particularly true with intricate jobs where dimensions are critical.

No detailed discussion on pattern equipment, production and maintenance can be attempted in this short article; however, there are some fundamentals which must be considered.

Every foundry should vest authority in some experienced man to make decisions on the most efficient and economical machines and equipment that will be used on new jobs before setting the cost. If the foundry is sufficiently large a department devoted exclusively to this important planning work should be maintained where every individual job is analyzed before attempting to quote casting prices.

In any case foundry personnel in charge of production castings should confer with the pattern maker to determine: The best method of manufacturing the pattern; the foundry requirements for making the pattern; and the best method of molding to produce quality castings at the lowest cost.

All new pattern equipment prior to release for production should be checked, and no quantity should be made until the castings are approved by the customer. All patterns should be inspected and kept in proper repair. Poor patterns cause poor molds and slow production. Rapping plates should be placed on all loose patterns wherever practical. The molders should not be allowed to use dowel points for rapping.

All patterns in use should be cleaned daily. Points of gates and risers should be marked clearly on all patterns. All patterns should be checked each time before production, and on long running or repetitive jobs checked periodically. All patterns should be properly marked according to standard pattern colors. Well kept patterns prevent undesirable mold patching and improve the quality of the castings.

Properly controlled molding sand is vitally important in the construction of castings. It must be recognized that a casting is only as sound as the mold will allow. There is little to be gained by casting controlled metal into a sand mold where the resulting properties of the castings are seriously impaired by imperfections. Defective castings not only will nullify the qualities and properties of the metal but will create a lack of confidence on the part of the design engineer.

Saving and Improvement

The economic value which can be placed on the proper use and control of molding sand may be expressed both as a monetary saving and as an improvement in the surface quality or saleability of the casting.

The general requirements of molding sand follow:

1. Sand should be sufficiently moldable to conform to the shape of the pattern with a reasonable amount of ramming. Some types of molding machines require a sand that will compact considerably more than others, and many even require a different type of sand, depending on the method of ramming.

2. The sand should possess sufficient green strength to prevent drops, particularly in the handling of the mold, and sufficient strength at elevated temperatures to prevent cutting and washing. Since both the green and hot strength depend to some extent upon the moisture content of the sand, great care should attend the tempering operations.

3. When moderately rammed a good molding sand must have sufficient permeability to allow the air in the mold, as well as the steam and gases generated when the mold is filled with iron, to escape rapidly, thereby preventing the scabbing of the mold and the blowing of the iron.

4. The sand grains must be sufficient-

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LET'S ALL BACK THE ATTACK

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ly fine to yield a satisfactory mold surface if the castings are required to be smooth and clean without the addition of graphite or other materials to the mold interface.

5. The sand must be made sufficiently refractory so that it will not melt or sinter badly when exposed to molten metal temperatures in the ordinary foundry practice.

6. The sand should be sufficiently collapsible after the metal is cast to allow for relative ease in cleaning operations and prevent hot tears and cracks. In general, since the choice of a sand with respect to fineness is determined both by permeability requirements and by casting surface requirements, better results in the majority of cases may be obtained by the proper selection of simple sands of a uniform distribution than by mixtures of coarse and fine sand. If sufficient coarse sand is used in the mixture to insure permeability, it will be this coarse constituent that determines the surface character of the mold and it will determine very definitely the surface character of the casting.

7. Excessive expansion, contraction, hot strength, or a combination of these properties at elevated temperatures, may cause defective castings. Therefore, the sand must possess satisfactory properties at atmospheric as well as at elevated temperatures.

8. The face of the mold must be designed so that it prevents penetration and so that it peels well from the casting. Since many cores are made from molding sand these should shake out rather easily if cleaning costs are not to be excessive and quality castings are to be produced.

Must Be Tried First

While there are definite rules for compounding molding sand mixtures, the success or failure of a particular mix usually is not known definitely until it is tried in the foundry. This is due to the many variables that exist when considering the field of molding sand mixtures. A mixture that may produce perfect castings in one shop may result in complete failure in another if not handled and applied properly. Therefore, each problem must be studied individually before any recommendations can be offered.

This difference in the results of the same mixture may be caused by different characteristics of the grain, differences in mineral composition of the grain, differences in the composition of the clay minerals, types of molding machines, methods of ramming, physical properties of the sand and binders, and probably many other variables.

A study of the effects of elevated temperatures on the ingredients added to molding sands is extremely important in order to obtain fundamental data on the properties of molding sand at casting temperatures.

The importance of this subject can best be understood when two sand mixtures are considered having the same physical properties at atmospheric temperatures, yet extreme differences at elevated temperatures—for example, sand mix *A* and sand mix *B* used for the manufacture of alloy steel casting.

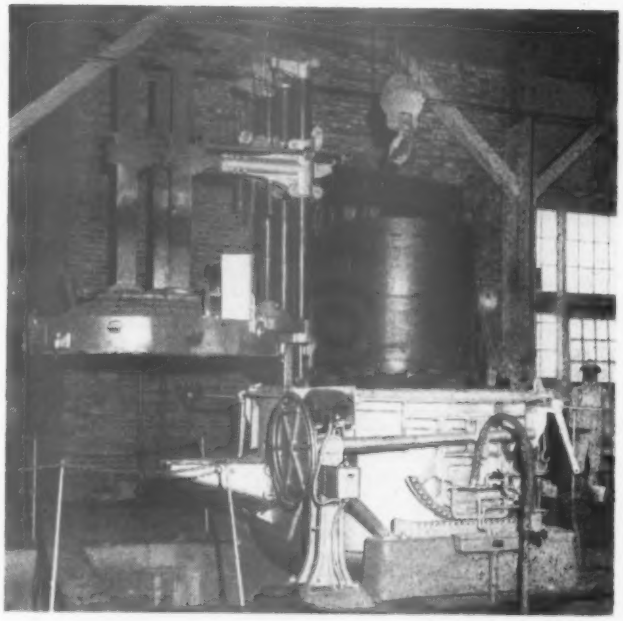
The physical properties of the facing sand of both mixtures are as follows:

	A	*B*
Moisture	4.5	4.9
Flowability	78	80
Green Permeability	60	64
Dry Permeability	122	116
Green Comp. Strength	3.6	2.8

According to the test data both of the above sands should react the same. However, *A* produced satisfactory castings free from hot tears while *B* did not. The *A* mixture was compounded with bentonite, silica sand, silica flour, cereal binder and wood flour, while mixture *B* was compounded with bentonite, silica sand, oil and silica flour.

From all indications of atmospheric temperature tests *B* should be more collapsible than *A* because of its lower strength. However, when the two sands were subjected to elevated temperature tests differences were readily apparent. Mixture *A* had a lower expansion value and a much lower hot strength value and lower collapsibility than *B*.

In the final analysis the condition of the sand in the mold is the real criterion



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of its fitness, and to correlate casting defects with sand control figures the reaction of molding sands and the mold at elevated temperatures should be known.

A number of precautionary measures for molding and core operations follow:

1. Investigate defects thoroughly and determine definitely the cause before changing sand mixtures.
2. All gates, runners and runner bars should be made in facing sand. Cores are preferred. Do not concentrate blows in the ramming procedure.
3. Approximately 90 per cent of the dirt in a mold is gathered between the runner box and the mold cavity. Runners should be deeper than ingates and should run past ingates to a dirt trap.
4. Reduce facing sand as much as possible—1 inch is as effective as a foot—but do not reduce facing at the expense of good castings.
5. Keep facing sands separate. Mixing cores and fine facing will often result in a poor surface finish causing scabs, buckles, and dirt inclusions.
6. Use a swab as little as possible.
7. A hot mold should be cooled before assembling.
8. An increased amount of slicking may cause scabs and buckles.
9. Blacking wash should be tested and maintained at a definite baume or specific gravity hydrometer readings.

It pays to standardize all coremaking operations. Both the sand and the binder should be measured and should be mixed for exactly the right length of time. Study oven conditions. Use a temperature recorder on the core oven, and remember that all core ovens do not dry at the same rate and time throughout.

Do not rap core boxes more than is necessary, otherwise the cores will not retain their shape—the core box also will last longer.

Do not use rods too near the surface. Test cores to see that they are firm and the vents clear before delivery to the molders. Be sure all core vents have free exit through the flask.

Local conditions frequently are responsible for inferior or scrap castings, and while these defects often are attributed to sand the real cause may be iron melting temperatures, unbalanced chemical elements, rapid iron solidification through delayed pouring, flask equipment, pattern design, gating, venting, mechanical difficulties, or a multitude of other causes including the personnel of the foundry, and the purely personal conditions of the men.

Pressure Drop Caused Trouble

To illustrate, on one occasion considerable drop defects occurred in a heavy casting foundry where 90 pounds of air was recommended for the jolters. This pressure was maintained at the machine until the valves were opened, then dropped rapidly due to the lack of a sufficient reserve supply. It was considered that weak sand was the cause of the defect. However, the defect was eliminated after the installation of an additional air accumulator to maintain the proper pressure at the machine.

In one centrifugal casting foundry defects caused by drops occurred in a small pocket of the pattern, and this was attributed to the sand. Molding practices as well as the source of the sand supply were changed but the correction was not found until it was observed that both of these defects were confined to molds made on one of the machines. This focused attention on that particular machine, and although operations appeared normal, the guide plates were found worn. This allowed the pattern to shift and caused the drop during the draw operation due to the uneven release of the pattern from the mold. The replacement of the worn guide plates eliminated the defect.

Molding machines located on loose or weak foundations may cause serious difficulties which often are attributed to sand. In one foundry the excessive wear of flask pins caused sticker defects originally attributed to the sand.

Improperly fastened pattern plates as well as broken cope bars may cause drops, while broken flasks have been known to cause cracked molds. Therefore records of sand testing and control will aid materially and act as an effective guide to the answer of many casting defects and foundry problems.

(To be continued next month)

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PRECISION CASTING PRACTICE

(*Continued from page* 117)

metallic molding powder mixtures), hard rubber, bonded graphite, etc., have been found suitable for the formation of the replica.

Following the production of the wax pattern, one or more of these wax models may be assembled into a group, and joined together by attaching wax gates, sprues, risers, etc. so that the completed wax pattern is the exact model of the entire space to be filled by the metal.

Particular attention must be paid to the layout of the assembled wax pattern. In the first place, the design of this setup must be such that all of the wax can be removed readily from the mold which is to be formed from this pattern, whether the wax is to be melted or vaporized off. In the second place, the design must be in full accord with the casting method; that is, whether the casting is made by pouring into a mold spinning about its own axis, spinning about an axis external to the mold, or pressure or vacuum cast.

Obtain Directional Solidification

In addition, close attention must be paid, as in other similar processes, to the positioning of the patterns in the whole wax assembly with respect to the freezing of the molten metal, for it is obvious that freezing must first occur at the outer extremities of the pattern, and progress inward to complete the object itself and then progress through the side (radial) gates on into the central gate. This is a fundamental requirement in that it not only gives the purging action which tends to move gas pockets toward and into the gates, but it assures the constant supply of molten metal to fill continuously the mold area while the frozen metal is decreasing in volume as it cools.

Using this wax model for the pattern, the next step involves the enclosing of this pattern in a refractory material which will (1) produce the desired finish on the completed casting, (2) maintain the size and shape requirements, (3) not evolve detrimental impurities at the high temperature of the metals being cast, and (4) not crack or spall during the casting operation.

Material to be used for the mold itself presents a number of problems involving finish and dimension, as previously mentioned. Dimensional changes are matters of actual determination as a function of the kind of mold material which is used, and the temperature of the mold at the time of casting. Compensation for the dimensional changes must be included in the master mold for the wax replica.

The problem of surface finish, which also involves the accuracy of reproduction of surface detail, can be solved only by the proper choice and selection of mold refractory which will cover the wax model accurately in every detail of finish and contour. It must bake out satisfactorily in the wax removal, withstand the thermal shock of the molten metal on its surface without cracking or spalling, and it must not be a source of any solid or gaseous contamination to the metal while being cast or during the process of solidification. In addition, it must be strong enough to withstand the stresses set up in these rather complicated assemblies during their cooling.

Refractories for this service usually are silica base materials bonded by a silicate or silica forming compound which set in a very short period of time, and are extremely stable both physically and chemically. Materials which will meet these requirements are rather expensive, and consequently must be used sparingly. Thus it is a general practice to apply this material in its fresh or green condition to the wax assembly by spraying, dipping, or brushing methods, followed by the subsequent application of a satisfactory lower-grade refractory. This part is then permitted to set-up, and is then put into a container which subsequently is filled with the lower-grade material.

After the entire mold assembly has

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become set, the next step is the elimination of the wax pattern. This is done by heating the assembly and permitting the wax to run out or be vaporized off, leaving the mold cavity which then is ready for pouring.

Another method of mold preparation makes use of a pattern which is covered by a thin membrane, the refractory being formed around the pattern in such a manner as to make a split mold. After the mold body has set up, the two halves are opened, the pattern removed, and the membrane eliminated.

To produce a better surface condition on castings made from some metals, there is a specialized practice in which the refractory has one or more compounds incorporated into its mixture which, in the casting action, effectively blanket the solidifying metal or form a glassy surface against the metal. Of course, such procedure is not generally applicable, due to danger of contamination to the metal or alloy being cast and to lack of control over the dimensions of the casting.

A number of factors combine to determine whether the metal shall be poured into a hot mold or a cold mold, among which the following may be mentioned as indicative:

1. Intricacy of the detail to be reproduced.
2. Necessity of long distances of metal flow to fill the casting cavity.
3. Number of side-gates to be run.
4. Requirement to cast items of large area, thin section, and possibly having knife-edges.
5. Presence of cores.
6. Control of dimensions.
7. Control of direction of solidification.
8. Control of grain size.
9. Control of casting surface.
10. Control of cooling shrinkage.

No attempt has been made to list these factors in order of relative importance, for the simple reason that changes in pattern, materials, and requirements may completely alter the relative importance of these factors from one job to another.

As practiced in the dental and jewelry trades, the casting machine usually consists of a main support-bar or beam which is pivoted on a vertical axis, and motivated by a spring-wound or other suitable mechanism. The several sections of equipment are mounted on this support bar in such manner that the melting crucible or furnace is located centrally over or near the axis of rotation and the mold is near the outer extremity of the bar. These two units may be so arranged as to be adjacent to each other, in the above sequence or they may be connected by an intermediate (and sometimes separately heated) pouring trough. In either event a gate of some kind is interposed between the melting crucible and the furnace, thus permitting the proper compounding and fusion of the metal or alloy in the crucible.

Describes the Arrangement

As one example of operation of equipment of this type, the supporting beam is rotated in a reverse direction against a spring mechanism, winding the latter to the tension required to give the desired forward rotational speed during the actual casting. The beam then is latched in this cocked condition. Following this the metal or alloy is brought to the proper casting temperature in the furnace and the previously prepared mold (and pouring trough if desired) are attached to the furnace in such manner as to permit the uninterrupted flow of metal from the furnace into the mold.

When these assembly operations have been completed and the melt is in the proper condition, the support beam is released and whirls the mold assembly around the central axis. At the time when the rotational speed and the temperatures of melt, trough, and mold are satisfactory, the furnace gate is opened and the molten metal flows into the mold cavity under the effect of the centrifugal force generated by the spinning of the assembly.

The more recent counterparts of the commercial centrifugal units have several variations, such as the assembling of many individual molds around a wheel in a manner comparable to that shown schematically in Fig. 4. The gates from these individual molds all progress radially toward the hub of the wheel.

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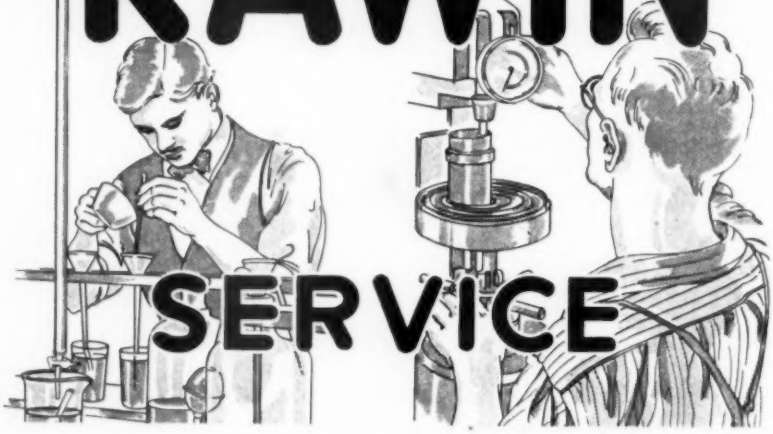

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terminating in a central pouring gate or trough. In operation, the wheel is rotated at the desired speed, and the molten metal is run directly from the melting furnace into the mold, or the pouring is done by ladling the metal into the spinning molds.

In one of the pressure casting methods used commercially, the casting unit, Fig. 2, consists of a totally enclosed indirect arc furnace which is mounted on trunnions and is capable of being inverted. The top of the furnace has a small aperture which serves as a charging and observation hole, as well as the pouring exit. In addition to this, a mold-clamping arrangement is attached to the top of the furnace.

When the furnace charge has been melted properly, the mold assembly, prepared as described previously, is placed in an inverted position on the top of the furnace in such a manner that the furnace exit and mold entry coincide, and are separated by a thin section of soft refractory gasket material. The mold is clamped in this position.

Actual casting takes place by inverting this composite unit, at which time the metal runs into the centrally located gate and flows through the several side gates into the individual mold cavities. After a few minutes for metal solidification the mold is removed, and the furnace returned to its original position.

Use High Alloy Materials

Through this casting arrangement, considerable experience has been gained in the use of alloys ranging from the 13 per cent chromium steels through various nickel-chromium alloys, to the more refractory cobalt-base alloys and on into the refractory carbides. These alloys are being cast into bucket blades, the buckets being either single or in consecutive gangs, with an as-cast surface requiring nothing more than a finishing operation and polish, and with dimensional tolerances within a few thousandths of an inch. The entire operation and resulting products are of such excellent quality that this method is now in position to compete with conventional fabricating methods on the forgeable alloys.

The ease with which complicated shapes can be reproduced to accuracies of the order of a few thousandths of an inch, together with a surface finish capable of accurately reproducing 1/16-inch, part numbers stamped on the surfaces, makes this process a potentially powerful production tool. In addition, most parts can be readily cored. Also, this method has been used for the production of bimetal parts wherein the higher-melting alloy is cast first (or used as an insert in the mold) and the lower-melting metal or alloy subsequently is cast. This provides a convenient method of making composites which utilize a minimum amount of the more highly alloyed strategic materials by using them as the working surfaces only.

In the field of the more common grades of low-alloy structural steels, only a very small amount of work has been done because primary interest has, by force of necessity, restricted activities to the high-temperature alloys. However, now that it has been demonstrated that the technique of the method has been developed to a stage whereby castings weighing 5 to 7 pounds can be precision cast, it would appear to be advisable to promote development in the handling of the structural steels.

Bottlenecks caused by the extraordinary amounts of machine and hand labor required on many ordnance parts may find relief in the application of this precision casting method, subsequent to the necessary development work.

Necessity of adequate research and development work is predicated on the known requirements of steel melting and remelting which demand strict adherence to considerations of such factors as casting temperature, gasiness of the melt, reaction with the refractory (investment), necessity of exact control of carbon content, and the requirement of meeting metallurgical reaction characteristics which will permit the introduction of these cast parts into present, established, heat-treating facilities with proper response to these treatments.

These factors do not appear to be properly appreciated by most of those now interested in precision casting, and

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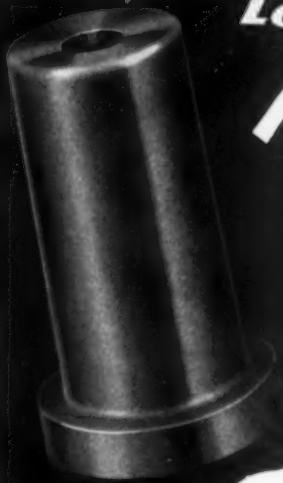

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license is taken to incorporate in this survey the precautionary warning that all of these factors (and more too) must be strictly observed or the resultant products will prove detrimental to the process.

It may be assumed from the previous discussion that the developments of this precision casting process tend to displace many machine and hand-produced parts made from forged or wrought metals; thus the inherent possible defects must be taken into consideration. Consequently, it should be a cardinal principle of those concerned with the production of precision-cast parts to exercise adequate x-ray inspection, supplemented by higher percentages of samples taken for tests of mechanical properties than has been customary with parts made from wrought or forged materials. The exercise of adequate technical control of the process, coupled with careful inspections, will assure the production of satisfactory parts.

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R. H. Stearns, who is celebrating his twenty-fifth year as president of the Stearns Magnetic Mfg. Co., Milwaukee, was the guest of honor at a party for his office employes who presented him with a handsome silver scroll inscribed with the names of his fellow workers to commemorate the occasion. Among those present were his son, R. N. Stearns, sales manager; H. W. Harman, national sales representative; C. F. Broetzmann, chief engineer, and Hugh Sharp, advertising manager.

METALLIC MATERIALS REPORT

(*Continued from page* 119)

for reliability. Some observers claim quite direct correlation between impact test values and behavior in some kinds of severe service; others challenge the validity of such a correlation. What meaning do notched bar impact results have in relation to different types of engineering service?

The problem of wear resistance and avoidance of scuffing is one of the most complex that faces the development engineer. Are there reliable methods of appraising such resistance?

So far, experience and intuition largely have guided the choice of materials for high temperature service. More or less standardized methods of evaluation of creep resistance and of life-to-fracture or stress-rupture are now being employed, but loads in the latter are much higher and elongation produced much greater than permissible in service. Are such data reliable guides?

It is not expected that final or complete answers to these and the related but unmentioned problems will be forthcoming, and it may well be concluded in respect to some of them that we are not yet even on the road to satisfactory answers. But it has been said, "It is worth quite a bit to know how much one does not know".

Part I

Statistics show that our alloying elements for steel must be spread more thinly. Consider the U. S. use — in short tons—for 1937 and 1943 as shown in the accompanying table. There are other uses for these elements, so the total applicable to steel alloying is less than that listed. Quite a tonnage of alloying elements has to be reserved for the very highly alloyed stainless and high speed steels.

Table I

	1937	1943*
Manganese	320,000	600,000
Silicon	120,000	200,000
Chromium	35,000	150,000
Nickel	52,500	125,000
Molybdenum	4,000	30,000
Tungsten	4,400	10,000
Vanadium	1,125	3,000
Alloy Steel	2,000,000	15,000,000
Sum of Nickel, Chromium, Molybdenum, Tungsten, and Vanadium	97,000	318,000
Ratio of the sum of these five alloying elements to tonnage of alloy steel	1,000,000 to 48,500	1,000,000 to 21,200

*Expected, approximate.

A considerable tonnage of highly alloyed stainless steel, used not for corrosion resistance, but for toughness, is required for welding tank armor. Such requirements leave less alloy for the armor itself and for the usual constructional alloy steels.

This means that alloy steels must be so formulated that what we have available of the traditional alloying elements, must do the job for which we formerly used twice as much. Yet the steels must be as good, since we are using them for such things as aircraft engines, guns, projectiles, and armor.

To accomplish this, the alloy content of scrap steel must be utilized to best advantage, maximum utilization of the more plentiful elements, manganese, silicon, etc. must be had, and the more highly alloyed steels must be strictly reserved for the uses which only they will serve.

To this end, the Society of Automotive Engineers, (SAE) steels are being substituted by the National Emergency, (NE) steels, not only on a voluntary basis but also through WPB orders.

That a wide range of chemical compositions may be utilized when the metallurgist is freed from arbitrary restrictions, with equivalent mechanical properties and equivalent performance in service, will come out in the subsequent discussion. It should be remembered that several NE steels, once specified as to composition and satisfactorily usable when the alloys to produce those com-

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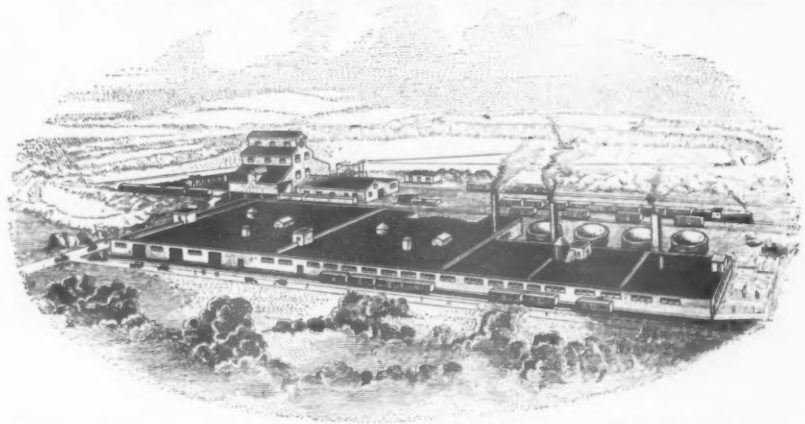

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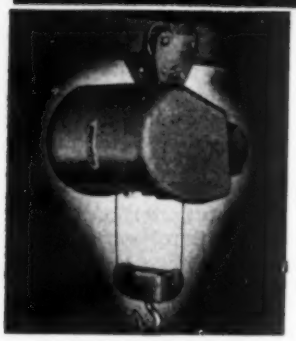

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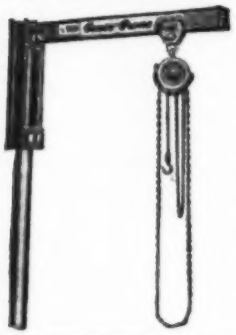

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positions were available, have been abandoned because they were not so economical of critical alloys as some of the later NE compositions. These present compositions, in turn, should not be viewed as fixed and immutable for, as knowledge of the use and control of the *addition agents* advances still further, reduction in the necessary amounts of critical alloying elements can be accomplished, provided the metallurgist is allowed reasonable flexibility in composition to permit using to best advantage the scrap he can get and the alloying elements that are freest in supply. A similar situation, as to stringency of supply, exists in the tin-containing alloys such as bronzes, babbitts, and solders.

Necessity for conservation and substitution of metals and alloys has led to a desire among design engineers for summarized data to which they might turn, without testing, for a complete and reliable answer to the question of what to use in place of the material formerly specified on the bill of material, but no longer available.

The desire for such data, to be used without scrutiny, could only be satisfied were each and every property of the substitute material *identical* with those of the formerly-used material. Nevertheless, it is usually possible to find a substitute that is *adequate, for a particular part*. However, for another part, of different section or subjected to a different type of service, a different substitute may have to be selected to be adequate.

Accumulate Case Histories

Case histories of successful substitution, in specific parts for specific services, are accumulating, some extrapolations may be made, and some general conclusions can be drawn therefrom. Engineers are properly hesitant in making extrapolations and drawing conclusions without the direct evidence of specific tests on the new material that offer real proof of its utility for the service planned, rather than mere presumptive evidence.

There are well-known, standardized tests for certain mechanical properties of metals, but there is always a question as to the interpretation of the results of these tests in respect to a particular engineering application. This problem is being faced.

The design engineer does not have time actually to become a metallurgist. To do so and to keep up with modern advances in metallurgy would take *all* his time. What he needs to do is to work with metallurgists, and the metallurgists need to work with the engineer. Only by close co-operation of the two groups can there be insurance that all factors, both the obvious and the subtle, are given proper consideration. Through such co-operation, the engineer can keep abreast of the rapidly changing metallurgical art.

No space will be taken to describe testing methods in detail; these can be found in readily available sources. Our primary topic is the *interpretation* of the

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More Information?

See page 68

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test data, the *evaluation* of metallic materials.

In war or in peace the aim should be to *use* each material and each alloying element where it will best serve the engineering necessities. Such use is true conservation. Refraining from use of alloy where refraining leads to an unserviceable product, is waste, just as much as it is waste in war to put in more alloy, or in peace more expensive alloy, than is required to make the product serviceable.

Just as certainly it will be found that high alloy steels are indispensable for some present uses, and, further, their wider use will allow the designing of better equipment than we now design. It is because high alloy steels are indispensable in warfare that we now have to reserve the alloys for the truly indispensable uses and must appraise each use from that point of view.

Quite as intensive work as is being done to eliminate unneeded alloys is being done to develop new alloys with hitherto unobtainable properties, even though the alloy requirements turn out to be very high, and even for scarce and expensive elements. This is in order to make possible the designing of new instruments of warfare and the introduction of revolutionary economies in peaceful applications. Many such designs are stymied for lack of material that will have the properties the designer knows must be had before his brain-child can exist in more concrete form than a drawing.

Probems Are Pressing

In such investigational work, the problems of test methods and of their applicability are just as pressing as in the case of evaluating the equivalence of materials for a part already in huge production. One difference between the two cases is that when the design is a brain-child only, the designer does estimate carefully the desired service conditions, he states them to the metallurgist and he will be satisfied nicely when the metallurgist produces an alloy that *just* fills the bill, without showing unneeded attributes.

From this point of view, the designer, when thinking only of ultimate performance, not of methods of production or availability of material, wants merely a piece of certain final dimensions that will stand the design stresses under the various conditions of service. He doesn't care, when he is in that frame of mind, whether the piece is made of steel or silver, whether it is cast or forged, machined or ground. When in this mood, he designs gas turbines, for example, that would require materials resistant to, for the present, impossible temperatures, for which materials he would gladly pay fantastic prices. Thus he sets a goal for the metallurgist to approach as closely as he can. Until the metallurgist attains that goal, the designer is forced to scale down the stresses and temperatures to those within the range of some material available at present.

Likewise, the designer has to modify

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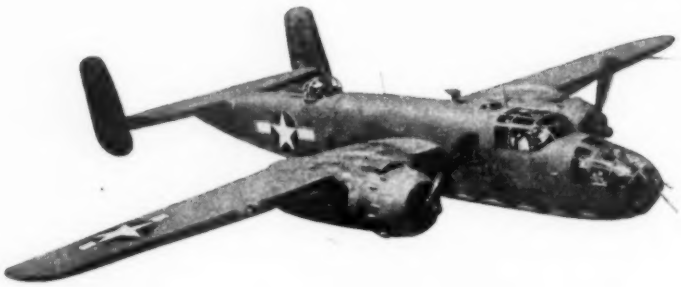

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his wishes according to the ability of the various possible materials to be fabricated by production methods and to be obtainable.

The design engineer meets his most difficult problems as to choice of materials when he is designing for strength *in large sections.* It is for strength in large sections that alloy steels are needed and it is with alloy steels that the path toward conservation and substitution is not as clear as with other materials. The relation of chemical composition to the properties of large heat-treated steel sections therefore is receiving much attention.

Specification of cast iron and cast steel by chemical composition has long been outmoded. Cast iron is sensitive to the rate of cooling, which of course varies with the size of the section cast, so the same composition gives different properties in different sizes. Hence, it is necessary to evaluate and specify cast iron by its mechanical properties, as tested on specimens representative of the size of section being cast.

Cast steel is notably affected as to toughness by the size and distribution of nonmetallic inclusions, which are governed, not by the chemical composition, as ordinarily determined, but by very small additions of control elements, such as aluminum or titanium, put in just as the metal is ready to pour. Few specifications limit the composition of cast steel, only the properties are specified.

Use Correct Amount

Armor, whether cast or wrought, is specified and evaluated on the basis of ballistic tests; the chemical composition may be anything, so long as the tests can be met.

Lacy and Gensamer[1] studied the strengthening of carbonless iron upon alloying it with various elements to simulate the alloyed matrix in which the carbides of these nonheat-treated steels are embedded. The plastic deformations, i. e. the stress-strain diagrams of the tensile test, could be made identical. The authors say "It makes no difference whether a curve is obtained by using X per cent of element A or Y per cent of element B; if the correct amount of alloying element is used, the flow curves will coincide." That is, chemical composition can be widely varied with identical mechanical results.

Chemical composition counts in steels for corrosion-resistant service, because corrosion is a chemical attack. It counts indirectly in certain types of steels for wear-resistant service, because some alloying elements help to produce specially wear-resistant particles (carbides) of different mechanical properties than those in nonalloyed steel. It counts in the extremely highly alloyed steels used for the most severe high-temperature service, because we as yet know too little about the structure required for best performance in such service to describe it in any other way. Yet, both in the special wear-resisting and the heat-resisting steels, there is a considerable de-

gree of replaceability of one alloying element by another.

In the usual, heat-treatable, constructional steels, whose utility depends primarily on mechanical properties of strength and toughness, those properties are essentially conferred *only in an indirect way* by the alloying elements.

Steel is an alloy of iron and carbon. Iron exists in different crystal forms at different temperatures, and the way the carbon is held is different in the different forms of iron. The carbide particles are hard and brittle, the iron matrix is soft and tough. By adjusting the amount of carbon and hence of carbide, and by securing (through the medium of rate of cooling) a dispersion of carbide particles through the matrix, the properties of the steel are adjusted to run the gamut between soft iron and tempered spring steel.

The primary feature that controls the compromise between softness and toughness on the one end, and hardness and brittleness on the other, is *the spacing between* carbide particles. When the carbide particles are few and large, so that the matrix offers only slightly interrupted paths to internal shear resulting from the applied stress, the steel is weak but tough. When the carbide particles are many, small, and uniformly dispersed, so that the paths through the matrix are short, the steel has much greater strength and diminished toughness. The secret of the control of properties in steel is the control of the distribution of carbide.

Precipitated During Cooling

The carbide particles are precipitated during cooling. The steel is cooled down in the furnace when *annealing* is being carried out, or in the open air in *normalizing* (so called because steel cools in "normal" fashion from the rolling temperature); or, once it has cooled, it may again be reheated to the normalizing temperature (at which the carbon is in solution) so as to be ready for air cooling. The lower the temperature at which the precipitation occurs, the smaller are the carbide particles. Hurrying the cooling through the upper end of the range of temperature over which this precipitation occurs, retains more of the carbon to be thrown out at the lower end of the range, and in finer form.

The ability of the carbon to come out rapidly at the high end of the range is somewhat reduced by the introduction of alloying elements; that is, the alloy steel reacts more sluggishly on cooling.

Obviously, if we could sufficiently hasten the cooling so as to postpone carbide precipitation to the lower end of the temperature range, we could secure improved properties. But steel has too low a thermal conductivity to make this feasible in large sections, the heat will flow from the center to the outside only so fast, no matter how fast it is taken away from the outside. A piece of red-hot steel can be plunged in water until the outside is black, then pulled out, and the surface will get red again as the heat stored in the inside slowly goes

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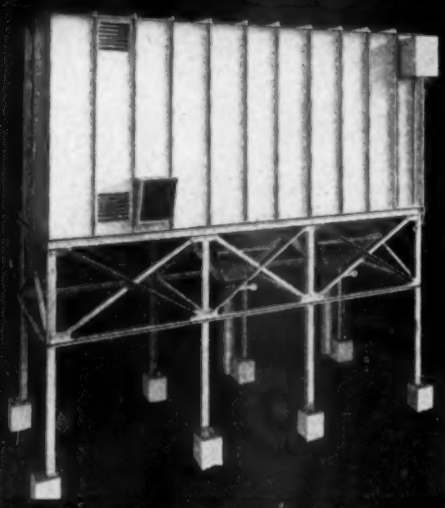

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to the surface. Thus, there is a size effect in normalized steel.

The thermal conductivity of the steel sets a limit to the strength obtainable in normalizing. By piling in alloys the strength in small sections of normalized alloy steel can be raised to around 100,000 pounds per square inch tensile; 80,000 pounds per square inch yield strength, but in large sections, 90,000 tensile, 65,000 yield are about the limit, for example, in large forgings that cannot effectively be quenched and tempered, and so are normalized, no matter how highly they are alloyed. When a piece is extremely massive, or has some very heavy sections, the designer had best rest content with such a strength level, for attempts to quench may be not only ineffective, but harmful, producing quenching cracks.

The level of strength attainable by normalizing is not sufficient for many engineering uses; it is necessary to *heat-treat*, by *quenching* and *tempering*, to get a better distribution of carbide, i.e. shorter paths through the matrix and hence a higher strength.

Effective quenching prevents the separation of carbide on cooling through the normalizing range. If *none* of the normalized structure is allowed to form, a steel of suitable carbon content becomes file hard after the quench.

Agglomeration Plays Part

On reheating, i.e. tempering (drawing), carbide particles separate from the hardened mass. With higher temperatures or longer times of drawing the carbide particles agglomerate, thus opening up longer paths through the matrix. By carrying the agglomeration to various degrees, tensile strengths can be secured ranging from around 275,000 pounds per square inch, with a few per cent, say 10 per cent elongation, down to around 100,000 pounds per square inch, 25 to 30 per cent elongation, in heat-treatable steels.

The essential requirement in getting the full hardening that permits entering this superior range of properties is avoiding the development of the normalized structure that gives the inferior range of properties. Suppression must be exercised to prevent that occurrence. Quenching is a preventive measure. Suppression is exercised when the *rate of cooling* is sufficiently fast. Each steel has a definite rate of cooling called the *critical cooling rate*. At the slower rates the steel acquires a normalized, or analogous structure, and does not become file-hard. At faster rates, it avoids the normalized structure and does become file-hard. This is schematically shown in Fig. 1[2].

If the section is small enough so that the center is cooled at the necessary rate in quenching, and full hardening occurs throughout the section—*no alloys are needed*. Watch springs of carbon steel are thin enough to harden throughout, and no quenched and tempered alloy steel has ever been found to have any advantage over carbon steel for

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watch springs, in respect to mechanical properties, and aside from corrosion-resistance.

This indicates what is now realized to be true, that it is the *structure*, i. e., the spacing of the carbides in the matrix, that controls the mechanical properties. If the section is small enough so that full hardening results on quenching, there is no need for adding alloys.

The maximum hardness obtainable by full quenching depends on the carbon content, not on any moderate alloy content, as is shown in Fig. 2.[3]

Thus, a fully hardened 0.20 per cent carbon steel attains 50 rockwell "C", a 0.50 per cent carbon steel attains 65 rockwell "C", so the evaluation of full hardening through the hardness measured in the *standard hardenability test* has to take the carbon content into consideration.

Just as was noted in relation to normalizing, the thermal conductivity of steel is so low that even the most severe quench will not draw the heat away from the center of too large a section fast enough to reach the critical cooling rate, in carbon steel.

Addition of alloy makes the steel more sluggish; that is, it shifts the critical cooling rate for hardening to a slower rate, one capable of being reached in the center of a larger section. As the section is increased, more alloy must be piled in.

Structure Tempered Back

It makes little difference what alloy or combination of alloy is used to bring about this shift in critical cooling rate.

Once a completely quench-hardened structure is obtained, and this structure is tempered back to a given tensile strength or hardness, the yield strength, elongation, and reduction of area are closely alike, no matter what alloying elements have been used.

This means that, insofar as the strength and ductility figures of the tension test evaluate properties, whatever effect the alloying elements may have had in modifying the nature of the carbide or of the matrix, are inconsequential compared to the simple mechanical effect of the spacing of the carbide in the matrix. It is like piling wood; whether the pile falls down or not depends on how it is stacked, not on whether the sticks are pine or oak.

From this point of view, it is quite immaterial what alloy combination has been used to allow exceeding the critical cooling rate and securing full hardening at the center of the section one wishes to harden. In steels of like grain coarsening behavior, or rather, so heated that their grain size is alike, the hardenability may roughly be computed from the chemical composition. But the computation is not by mere addition of the individual effects shown by each alloying element alone, for they are far more potent in combination than singly.

In this mutual assistance by a very little of each of several alloys, pulling as a team, lies the opportunity for vast saving of scarce alloys. So instead of

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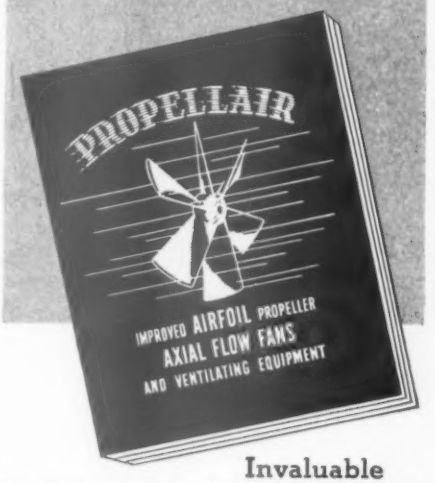

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specifying that the steel be made hardenable by the use of one or two big elements, the logical thing is to specify that the wagon shall be pulled out of the rut, that the steel be of the desired hardenability.

It then follows that specifying chemical composition as a means of getting hardenability, instead of directly specifying hardenability, is illogical.

It is especially illogical because hardenability is not solely governed by the gross chemical composition set forth in the SAE or NE steel ranges, but is equally affected by alterations in the method of *finishing* the heat of steel and in the *finishing additions* made when the molten steel is in proper condition to receive them.

(To be continued)

References

[1] Lacy, C. E., and M. Gensamer. The Tensile Properties of Alloyed Ferrites. Preprint No. 15 for October, 1943 meeting American Society for Metals.

[2] U. S. Steel Corp. The process and results of austenitic transformation at constant temperature. *Metals and Alloys*, Vol. 8, 1937, p. 22-24.

[3] This oft-reproduced curve from Burus, Moore and Archer, *Transactions* Am. Soc. for Metals, Vol. 26, 1938, p. 1, has been checked by Welchner, Rowland and Ubben, Preprint No. 24 for Oct. 1943 meeting, A.S.M., p. 10, for a large number of alloy steels. Their curve hugs the low side of the scatter of the plotted points in Fig. 2.

Advisory Committee Personnel Revised

Various changes have been made in the personnel of the WPB advisory committee for the nonferrous casting industry since that group first was established. The present membership includes: B. J. Flaherty, Johnson Bronze Co., New Castle, Pa.; William C. Hardy, Wm. A. Hardy & Sons Co., Fitchburg, Mass.; G. H. James, Richmond Foundry & Mfg. Co. Inc., Richmond, Va.; J. P. Jefferis, Janney Cylinder Co., Philadelphia; A. H. Lee, Lee Bros. Foundry Co., Anniston, Ala.; James J. Nelson, Cramp Brass & Iron Foundries Division, Baldwin Locomotive Works, Philadelphia; L. M. Nesselbush, Falcon Bronze Co., Youngstown, O.; Willard C. Peare, E. A. Williams & Son, Jersey City, N. J.; W. W. Rarity, National Brass Works, Los Angeles; Damon Wack, National Bearing Metals Corp., St. Louis.

Magnesium Practice

American Foundrymen's Association, 222 West Adams street, Chicago, has published a 148-page booklet entitled "Magnesium Alloys Foundry Practice." This is a reprint of 13 papers relating to the subject which were presented at the 1943 annual meeting of the association. Phases of magnesium founding covered by the papers include foundry practice, sand control, fluoroscopic examination, core sand reclamation, fire control and health aspects. Copies of the booklet may be obtained from the association for $3.

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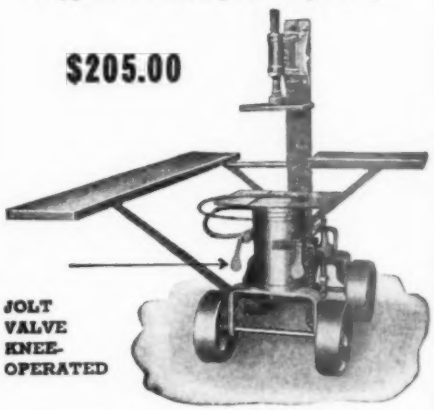

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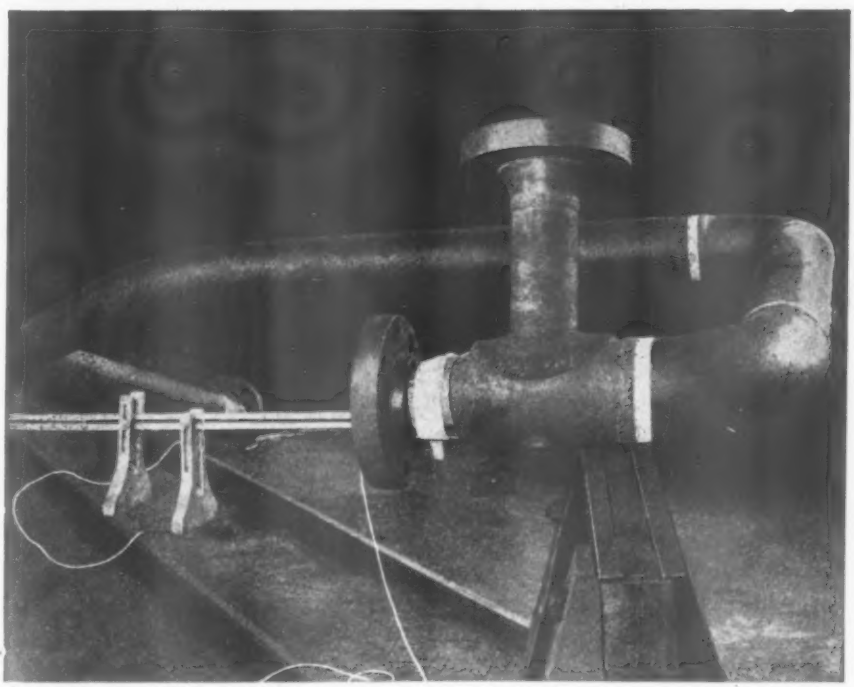

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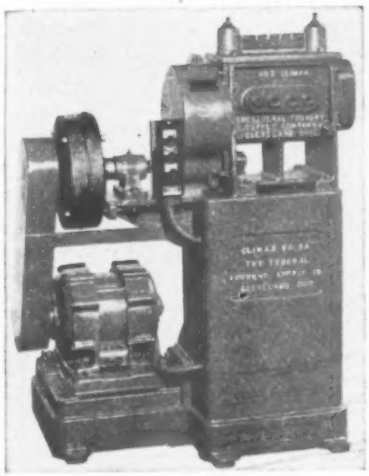

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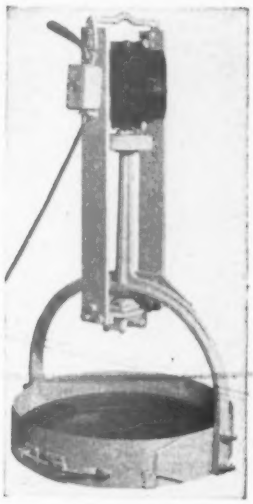

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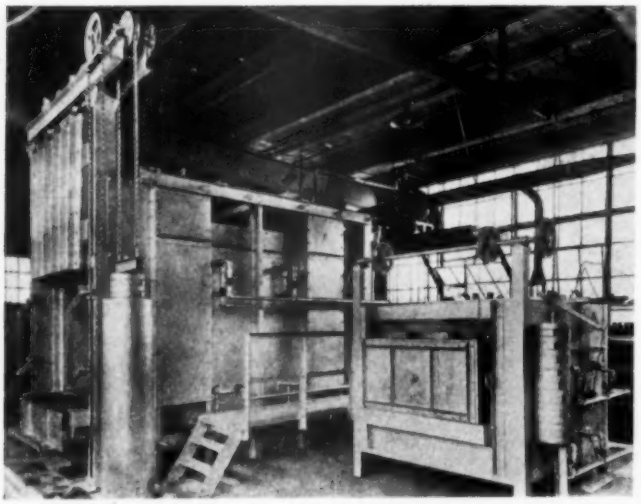

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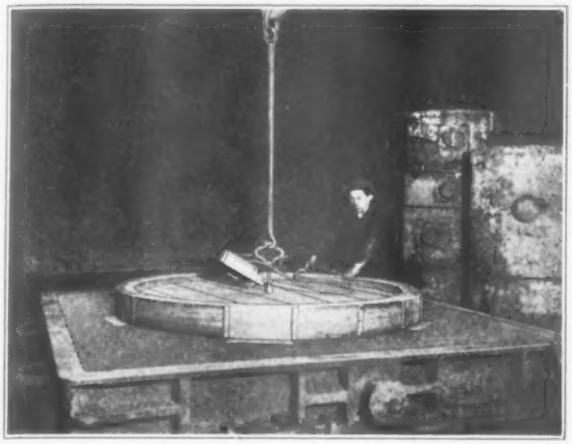

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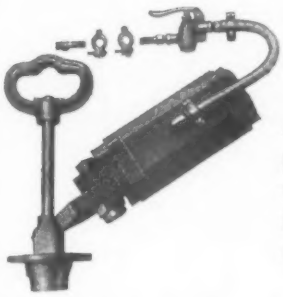

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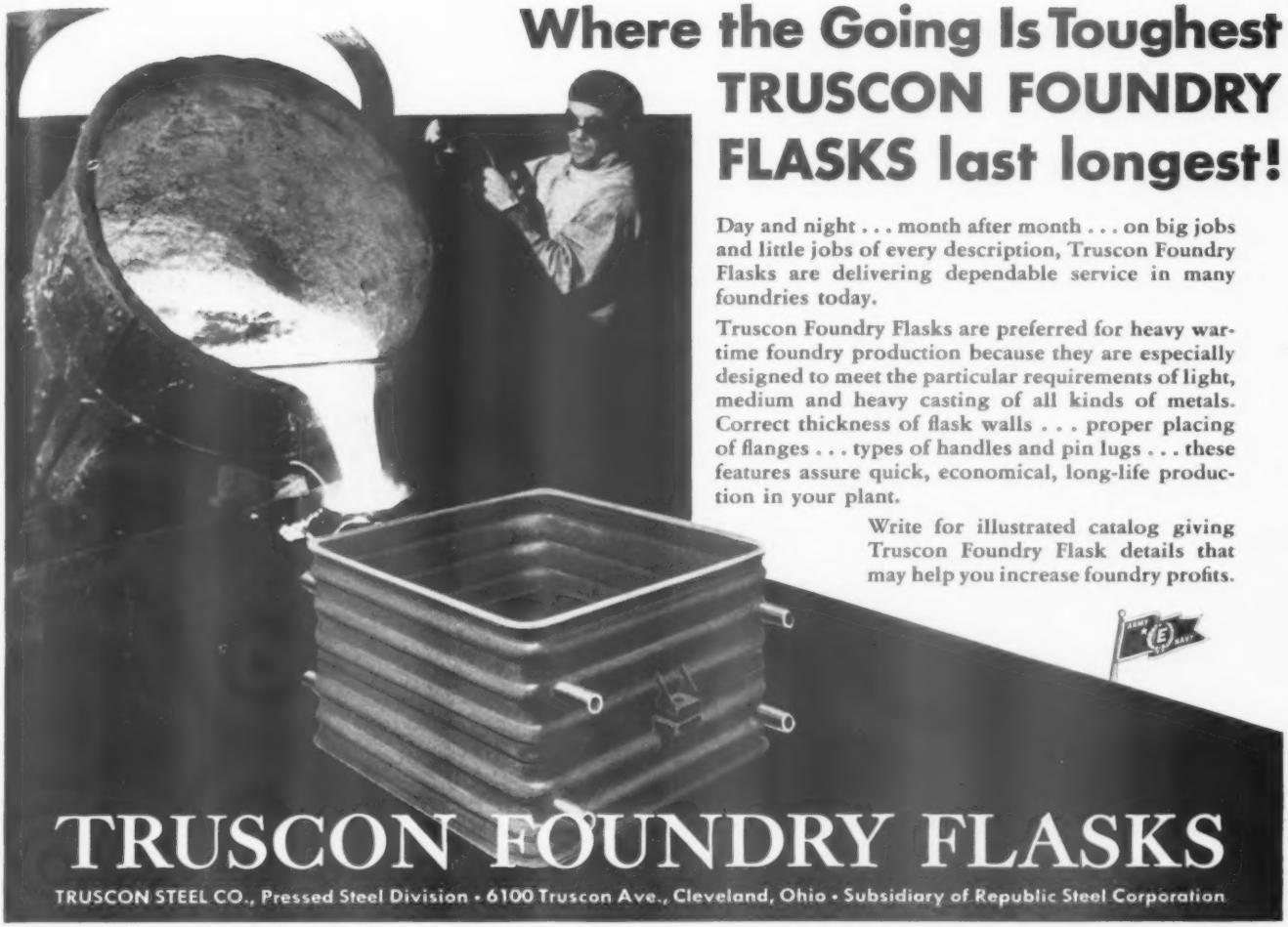

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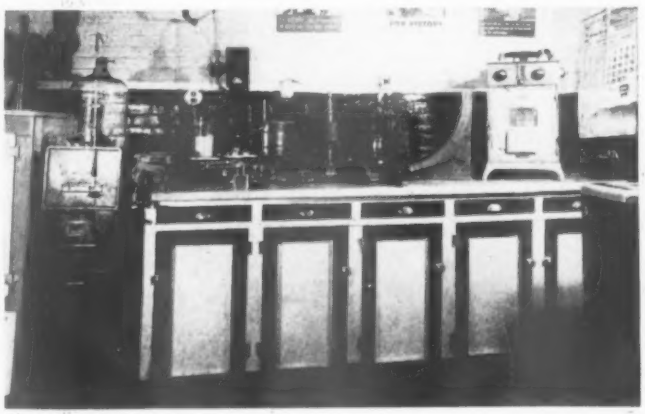

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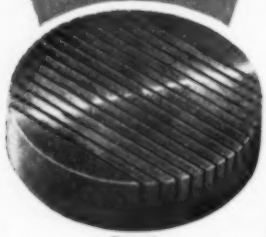

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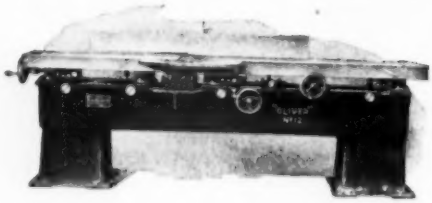

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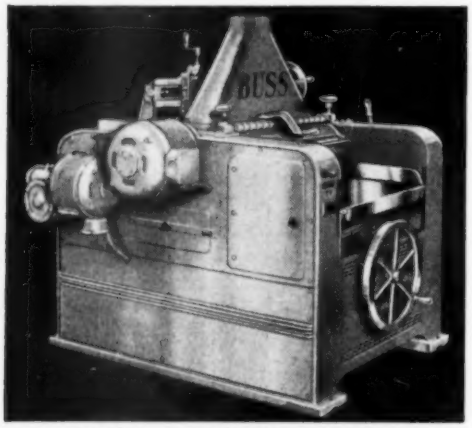

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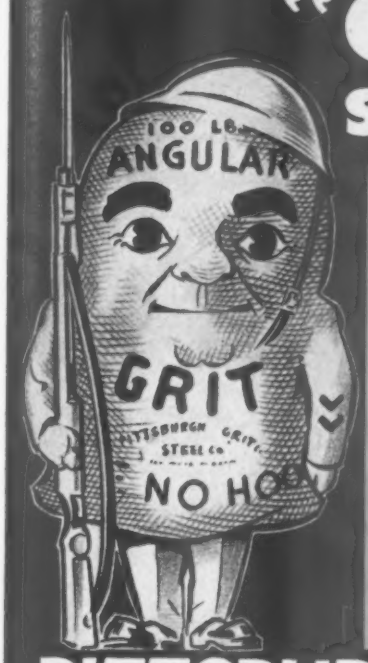

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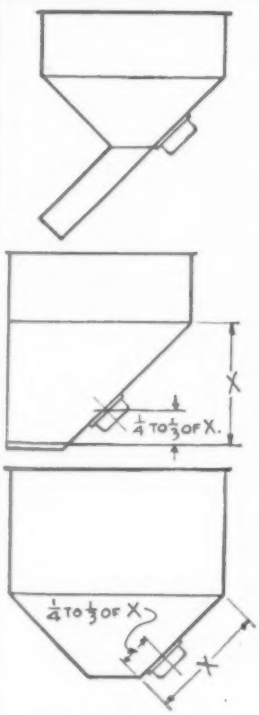

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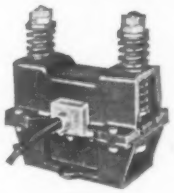

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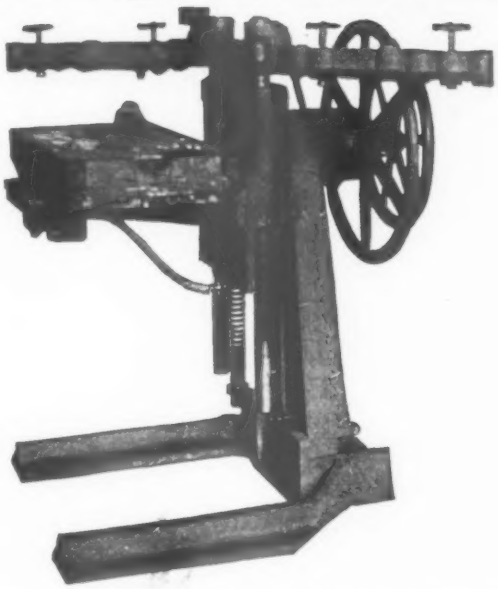

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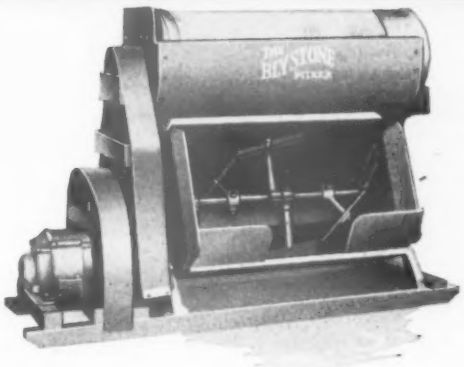

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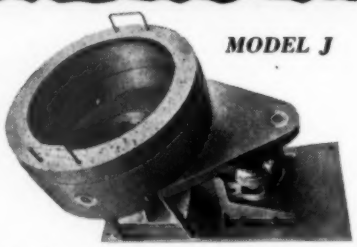

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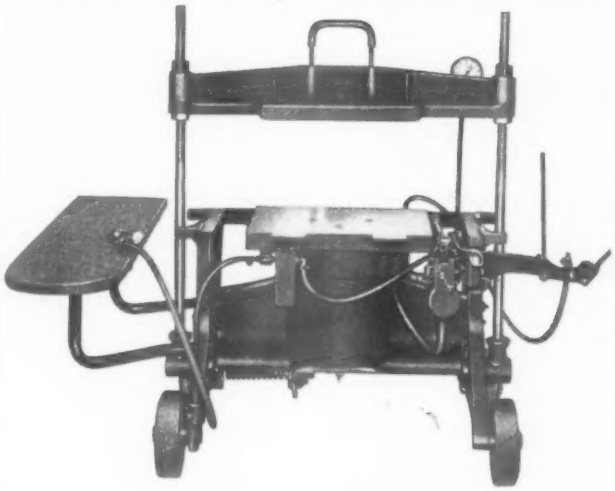

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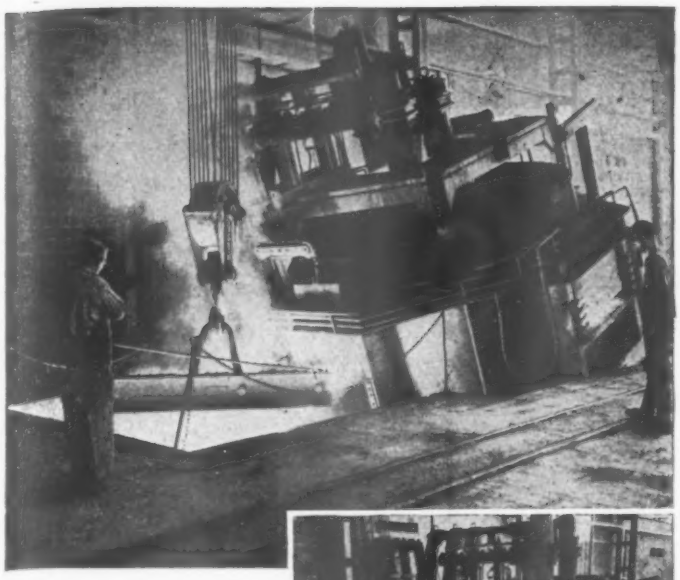

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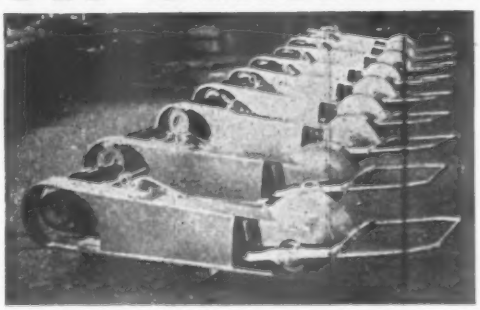

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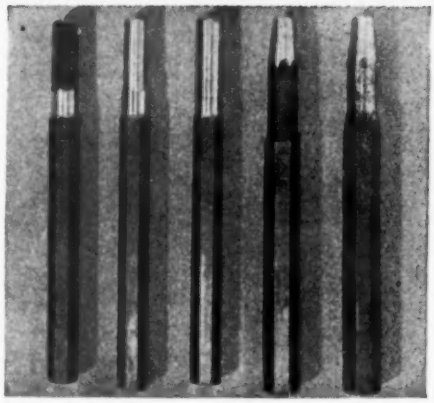

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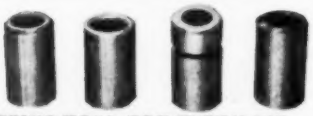

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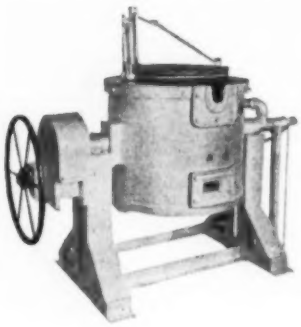

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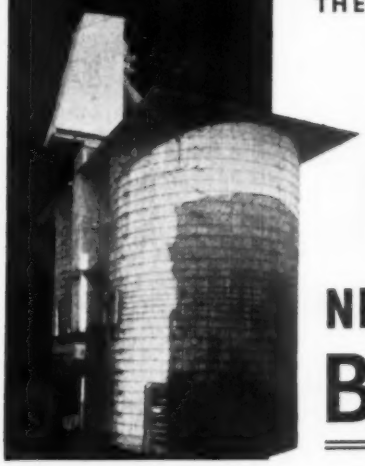

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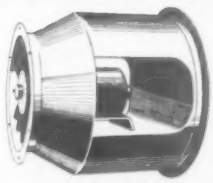

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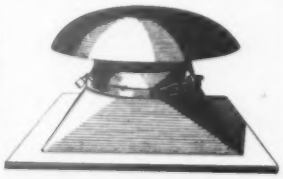

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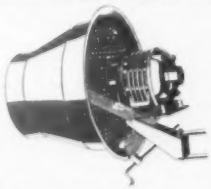

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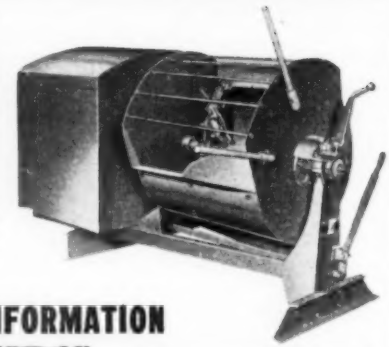

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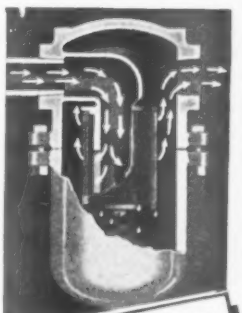

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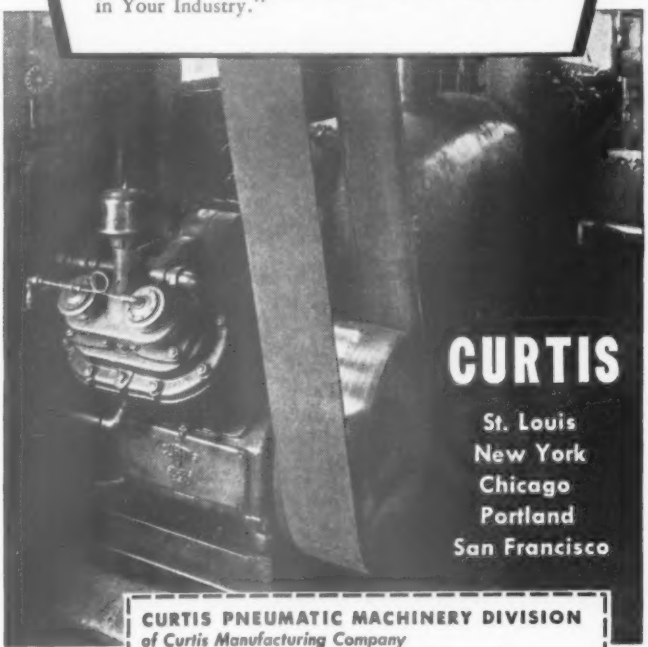

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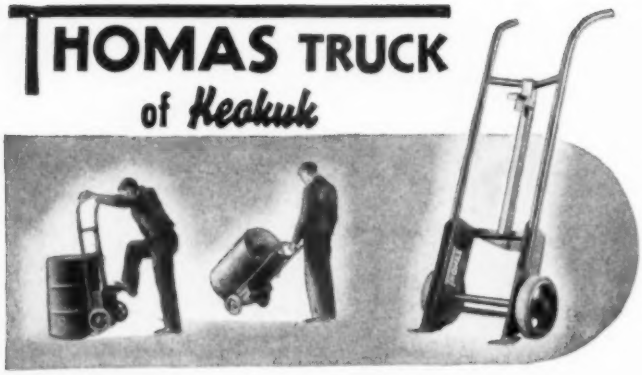

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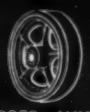

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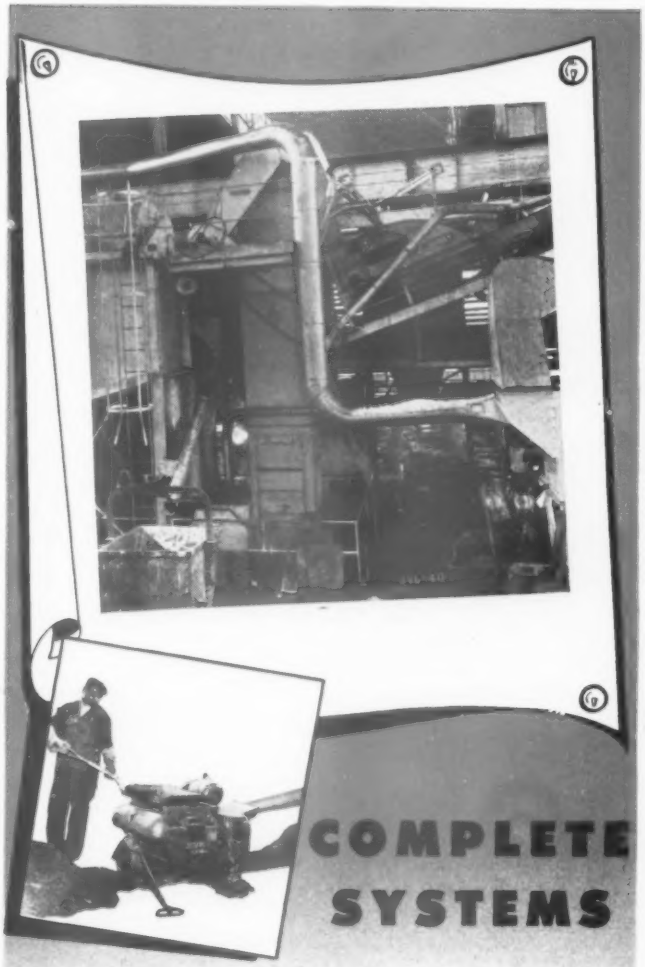

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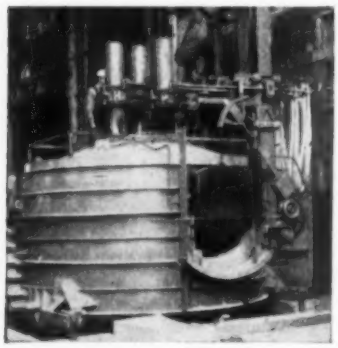

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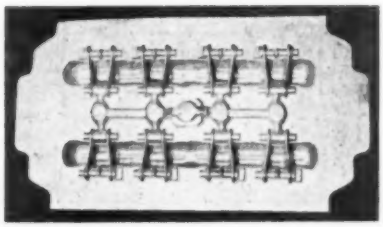

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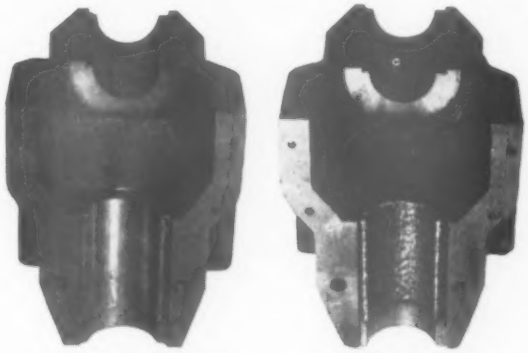

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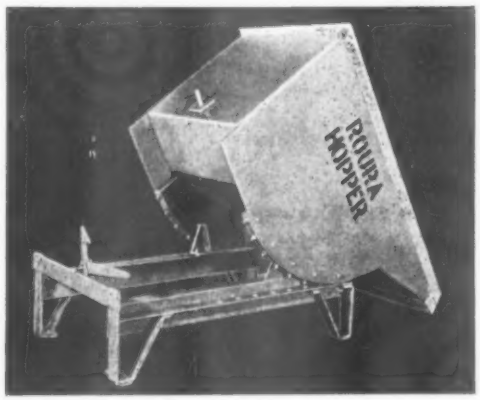

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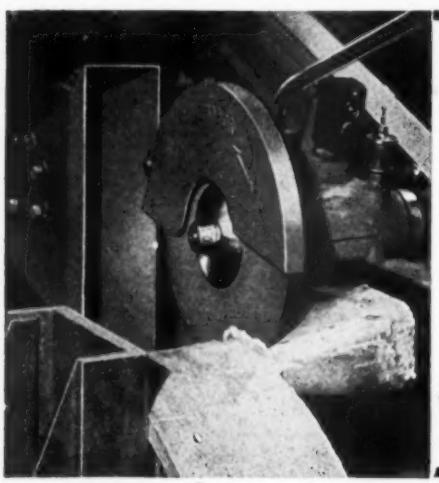

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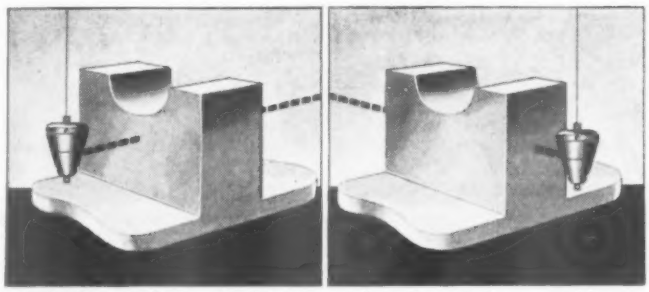

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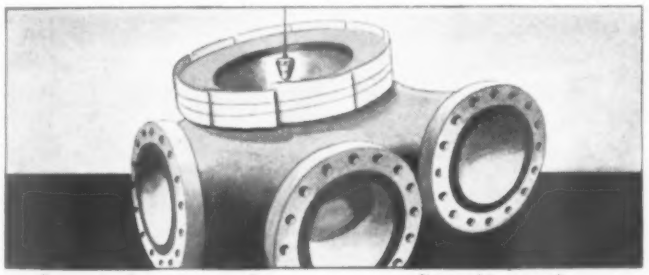

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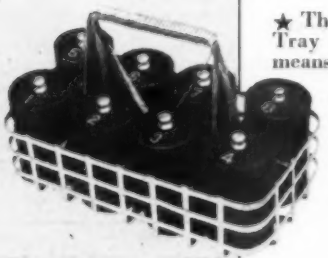

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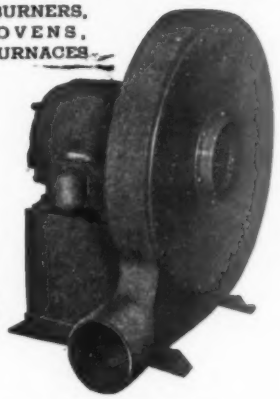

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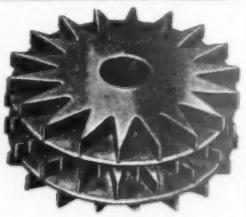

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STEEL FOUNDRY TECHNICIAN

To act in capacity of Assistant to Foundry Superintendent or Works Manager with 18 years' experience in all phases of foundry work. Producing Steel Castings ranging from 1 pound to 3 tons. Thoroughly familiar with heading and gating, good knowledge of molding and coremaking and capable of handling men. At present employed. Desires a change West of Mississippi. Address: Box 364, The FOUNDRY, Cleveland 13, Ohio.

Classified Advertising

Positions Wanted

CORE FOREMAN

Wants position with good reliable company. Knows core business on aluminum, brasses, malleable and gray iron. Prefer medium or light work in or around New Jersey. Available. Age 51. Address: Box 377, The FOUNDRY, Cleveland 13, Ohio.

PLANT MANAGER OR SUPERINTENDENT

Married, thirty-nine years of age, wife and two children, desires position with post war possibilities. Has background of twenty years' experience in gray iron. Well versed in all phases of the business both green and dry sand work. Can furnish excellent references. Prefer locating in New York, Ohio or Indiana. Address: Box 304, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT

Foundry executive. Twenty years' practical experience in coremaking, molding, patternmaking and cupola practice. Expert rigger, can estimate costs and ability to handle all classes of help successfully. Address: Box 366, The FOUNDRY, Cleveland 13, Ohio.

PLANT SUPERINTENDENT

Well versed in the production of iron, malleable iron, bronze and aluminum castings desires a connection in the South or Southwest. Successful record with some of the larger producers. Responsibly employed at present but desires better health conditions for one of the members of family. For complete details address: Box 234, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY EXECUTIVE-METALLURGIST

Twenty-five years' experience in light and medium gray iron and alloys. Technical and practical training. Excellent record and references. Specializing in organizing for production at lowest costs. Age 50. Interested in position where complete responsibility is required. Address Box 133, The FOUNDRY, Cleveland 13, Ohio.

SUPERINTENDENT OR MANAGER

Practical and technical gray iron foundryman. Twenty-five years' experience. Good habits and personality. Desires position with post war possibilities, references, capable of training men in all branches of the foundry—job shop preferred. Address: 342, The FOUNDRY, Cleveland 13, Ohio.

METALLURGICAL ENGINEER

Twenty years' experience in all phases of jobbing foundry operations in steel, cast iron and nonferrous metals. Desires position with established concern with post war possibilities. Would consider foreign service. Age 50. Address: Box 362, The FOUNDRY, Cleveland 13, Ohio.

PATTERN SHOP SUPERINTENDENT

With many years of foundry and core room experience desires new position. Am a good manager and know how to make patterns for production. Have made patterns for malleable and gray iron and nonferrous metals. Address: Box 345, The FOUNDRY, Cleveland 13, Ohio.

PERMANENT MOLD ENGINEER

DESIGNER WITH COMPLETE KNOWLEDGE OF MAGNESIUM AND ALUMINUM FOUNDRY METALLURGY SEEKS CONNECTION WITH NEW OR EXISTING FOUNDRY. ADDRESS: BOX 375, The FOUNDRY, CLEVELAND 13, OHIO.

FOUNDRY SUPPLY SALESMAN

Eighteen years foundry experience. Eight years as foreman and superintendent of large foundries. Broad acquaintance, member AFA. Age 41, high school education, single, neat appearing. Good references. Employed as superintendent. Address: Box 360, The FOUNDRY, Cleveland 13, Ohio.

Positions Wanted

GENERAL FOREMAN OR SUPERINTENDENT IN STEEL SHOP

Twenty-five years' experience in steel castings, 13 years as foreman and two years as superintendent. Fully experienced in handling men and all new methods of gating and heading of steel castings large and small in a jobbing or fast production shop. Have own mixes of core and moulding sand for making quality castings. Age 45. Can furnish the best of references. Address: Box 376, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT OR GENERAL FOREMAN

Foundry superintendent now employed desires to make change. Twenty-six years' executive experience in grey-iron and semi-steel. Practical man on green and dry sand, medium and heavy, well versed on high tensile metals and cupola practice. Address: Box 382, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY MANAGER & METALLURGICAL ENGINEER GRADUATE—FIRST CLASS

Twenty-five years' experience in all phases of foundry operations in Steel, Gray Iron and Nonferrous Metals, desires change with firmly established concern where his executive ability can be fully used and remunerated. Age 47. Address: Box 379, The FOUNDRY, Cleveland 13, Ohio.

GENERAL MANAGER AVAILABLE

A reasonable salary and definite arrangements secures the services of a mature, dependable General Manager who will save his pay several times over in eliminating wastes and skillfully handling personnel, sales, purchases, finance and other vital activities. Excellent experience foundry, machinery and allied lines. Correspondence in confidence. Address: Box 380, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT OR GENERAL FOREMAN

Thirty years' foundry experience of which has been superintendent and general foreman for twenty years on jobbing machinery, castings and practical foundryman in every detail. Best reference. Address: Box 323, The FOUNDRY, Cleveland 13, Ohio.

MR. HEATER MANUFACTURER

Available in late spring. A thorough and practical foundryman in the early forties with a background of 23 years of practical experience in the design and manufacture of hot air furnaces, boilers, etc. with several of the leading companies of the industry. Well versed in equipment design for topnotch modern production methods for a competitive market. Address: Box 352, The FOUNDRY, Cleveland 13, Ohio.

MAGNESIUM FOUNDRY ASSISTANT SUPERINTENDENT OR GENERAL SUPERVISOR

Seven years' magnesium experience in producing high quality and quantity aircraft castings. Can organize and control. Knows latest methods and mass production equipment. Thirty-three years' practical foundry experience. Thorough in molding and coremaking, good producer, cost and scrap conscious. Desires connection with post-war possibility. Available, age 51. Willing to locate anywhere in the United States or Canada. Address: Box 381, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRYMAN

Desires position as foreman of jobbing brass foundry. Thirty-eight years old, 20 years' experience as molder, coremaker and foreman. Good rigger. Can handle help and train green help. Do own alloying. Experienced on monel, nickel, silicon bronze, aluminum bronze and manganese bronze. Now employed but desires change with post-war future. Address: Box 193, The FOUNDRY, Cleveland 13, Ohio.

Positions Wanted

STEEL FOUNDRY CONNECTION DESIRED

Twenty-five years' experience, general knowledge in all phases, but feel especially competent in gating and heading, pattern mounting, coreblowing and handling labor. Age 43, six foot and 200 pounds. I am frank, tactful, diplomatic and understand management and labor problems. I am not a yes man, don't know it all but enjoy new problems and have an open mind to all new suggestions. Address: Box 383, The FOUNDRY, Cleveland 13, Ohio.

Employment Service

SALARIED POSITIONS

This advertising service of 34 years' recognized standing negotiates for high salaried supervisory, technical and executive positions. Procedure will be individualized to your personal requirements and will not conflict with Manpower Commission. Retaining fee protected by refund provision. Identity covered and present position protected. Send for details.

R. W. BIXBY INC.
101 Delward Bldg. Buffalo, N. Y.

GRAY IRON FOUNDRY EMPLOYMENT

We are receiving many inquiries for superintendents, metallurgists and foremen. We shall be glad to hear from qualified men. No charge.

Gray Iron Founders' Society Inc.
1010 Public Square Building Cleveland, Ohio

Wanted-To-Buy

MIXERS WANTED

Used Simpson Intensive Sand Mixers. State size, condition and lowest cash price for immediate acceptance. Address Box 578, The FOUNDRY, Cleveland 13, Ohio.

WANTED-TO-BUY

One used Whiting Easy-pour, de-sulphurizing ladle, capacity four to six-thousand pounds when lined. Address: Atlas Foundry Company, Marion, Indiana.

WANTED

Used 1000 pound per hour electric melting furnace with or without transformer. Address: Box 371, The FOUNDRY, Cleveland 13, Ohio.

Foundries for Sale

FOR SALE

Completely equipped foundry and stove factory on railroad siding, now in operation located in mining town in Northern Mexico. For particulars address: F. P. Low, Apartado Postal 3, Parral, Chih., Mexico.

JOBBING FOUNDRY FOR SALE

Gray iron, brass and aluminum jobbing foundry including machine shop and pattern storage buildings. Complete metal flask equipment. All-steel buildings up-to-date; traveling crane in each. Private rail siding. Must sell account of age and health. Located in Southwest. Part cash. Reply box 346, The FOUNDRY, Cleveland 13, Ohio.

Classified Advertising

For Sale

REBUILT EQUIPMENT IN STOCK
IMMEDIATE SHIPMENT

(1)—3-ton geared crane type Ladle.
(2)—¾" cap. Power Sprue Cutters.
(1)—10" Tabor Post Type Squeezer.

ELECTRIC MONORAIL HOISTS

(2)—3-ton Euclid 110/230-VDC.
(1)—1-ton Shepard, 230-VDC.
(2)—1-ton Shepard stationary mounted Hoists, separate variable speed controllers.
(1)—1-ton 2-motor Cleveland Tramrail, 220-VDC. FL. or Cage Operated.
(1)—6-ton LoHed Hoist, 220/3/60-cycle.

BUCKETS

(1)—¾-yd. 2-line Browning type Z-½.
(1)—¾-yd. Hayward Electric 220-VAC.
(2)—1½-yd. Hayward Electric 230-VDC.

OVERHEAD ELECTRIC TRAVELING CRANES

	TONS	MAKE	SPAN	CURRENT
(1)	3	Shaw	30'0"	230-VDC.
(2)	3	Euclid up to	40'0"	A.C. or D.C.
(1)	5	Euclid	30'11"	220-VAC.
(1)	10	P & H	58'3"	230-VDC.
(1)	10	American	54'1½"	230-VDC.
(1)	3	(new) Armington 3-motor 230-VDC. underslung FL. or CG. OP. Will furnish rebuilt to your span.		

WE OWN AND HAVE ALL THIS EQUIPMENT IN STOCK. IT IS OFFERED REBUILT IN OUR LARGE MODERN PLANT AND FULLY GUARANTEED.

T. B. MacCABE CO. 4304 CLARISSA ST.
PHILADELPHIA (40) PENNA.

FOR SALE

Roller Conveyor—405 ft. Mathews Ball Bearing; Rollers 14" long, 2⅞ diam.

Sand Mixer—Clearfield 6 ft. diameter. (Both above items purchased new in 1942)

Vibrating screen—Tyler Hummer Electric 4 ft. x 7 ft.

Jeffrey Portable Sand Conditioner, Type P.

Tilting Water Tumbling Barrel.

5 H.P. Witte Diesel Engine.

Electric Hoist—2 ton capacity. Alfred Box manufacture.

54—500 watt RLM Electric Light Reflectors.

BECKETT BRONZE MUNCIE, INDIANA

AIR COMPRESSORS

BELTED—176 ft., 355 ft., 540 ft., 676 ft., 752 ft. & 1300 ft.

ELECTRIC—355 ft., 528 ft., 676 ft., 807 ft., 1302 ft., 1723 ft., 2022 ft., 2200 ft., 2800 ft., 3600 ft., & 5000 ft.

STEEL TANKS

9—5000 gal., 11,500 and 18,000 gal. cap.
17—1000 bbl., 4000 bbl. and 10,000 bbl. cap.

TANKS BOUGHT AND SOLD

R. C. STANHOPE, INC.

60 East 42nd St. New York, N. Y.

FOR SALE

Lancaster Mixers EA-4 and EM-4—1940. Excellent condition. Address: Box 351, The FOUNDRY, Cleveland 13, Ohio.

FOR SALE
PANGBORN SAND BLAST

Type 2 GH-5 cu. foot barrel capacity. Direct pressure blast application. Complete unit with blast machine and abrasive separator. Arranged for motor drive. This unit is in perfect condition. Price cheap.

GLOBE TRADING COMPANY
920 W. LAFAYETTE BLVD.
DETROIT, MICH. CAD. 0198

For Sale

USED FOUNDRY EQUIPMENT

The demand for used foundry equipment of all types is urgent.

A short classified advertisement in The FOUNDRY will help someone locate much needed auxiliary equipment.

POSITION WANTED

Minimum advertisement set solid, 30 words $1.50. Additional words 5c each. Same advertisement all caps, 30 words $2.00. Additional words 7c each.

HELP WANTED

Minimum advertisement set solid 50 words or less $3.00. Additional words 6c each. Same advertisement all caps, 50 words $4.00. Additional words 8c each.

FOR SALE

Minimum advertisement set solid, 30 words or less $3.00. Additional words 10c each.

WANTED

Minimum advertisement set solid, 30 words or less $3.00. Additional words 10c each.

Miscellaneous advertisements such as "Personals", "Services" etc., minimum 30 words set solid, $3.00. Additional words 10c each.

Note: If replies are to be sent to a box number in care of The Foundry, add 6 words to your advertisement for box number and address.

ADDRESS
CLASSIFIED ADVERTISING SERVICE

THE FOUNDRY
PENTON BUILDING CLEVELAND, O.

COMPRESSORS AND BLOWERS

2100 cfm @ 12 oz. Gen. Elec. Centrifugal compressor with 10 HP 2-60-3450 RPM motor.
2—1200 cfm @ 11 oz. Buffalo Pressure Blowers, 9½" intake 7" x 7¼" outlet, with 7½ HP 3-60-1800 RPM motors.

SAND VIBRATOR

7 to 8 ton per hours, Jeffery-Traylor with vibrator M.G. set. Write, wire or phone.

THE MOTOR REPAIR & MFG. CO.
1552 HAMILTON AVE., CLEVELAND 14, OHIO

OVEN FOR SALE

Single Compartment Young Brothers Oven 13'3" x 27' x 6'3" high, inside. Gas fired 200° to 500° F. complete with automatic controls. Suitable for core drying. Address: Marsh Wall Products, Inc., Dover, Ohio.

FOR SALE

BLYSTONE MIXERS

Two new (unused) model B-2½ mixers, 11 cubic feet capacity with Titan drum, headliners and Titan mixer blades, clutch pulley drive. Immediate delivery.

DENNY & CLARK

910 N. MARSHFIELD AVE., CHICAGO 22, ILL.

For Sale

SPECIAL DEFENSE BARGAINS

Cast Iron and Steel Plate Mill-Dust & Shavings Exhausters 50 in stock. **Cupola and Furnace** Blowers for Coke, Oil or Gas Combustion.
1—Spencer blower 3600 CFM @ 1½ lbs.—40 h.p. motor, and blast gate.
2—Sprague 4 Ton Electric Hoists 115 V.—D.C.
1—Sprague 2 Ton Electric Hoist 115 V.—D.C.
Tumbling Mills—2 cast iron for brass cleaning.
1—Sly 48" x 60"—1" thick round steel shell.
Furnaces:
1—US Rotary No. 3—Melting or Smelting.
1—Pair Monarch-Rockwell's—Rotating, each 500 lbs. cap. mounted together on base, oil burners available, when used together waste heat from one preheats other.
1—Hausfeld, Tilting Open Flame 400 lb. capacity—non crucible.
1—Stationary for up to No. 70 crucible.
1—Al. Fdy. Eq. Co. Model-550 TW. Tilting Crucible for No. 275 Crucible, Core Ovens, Portable.
1—Buckeye Semi Circular 5 revolving shelves, gas or coke fuel.
1—Core oven, portable 4-6" high 4 shelves gas fired, insulated.
1—Core Sand Mixer, Triumph make (dough mixer type) approx. 4 cu. ft. cap. 3—H.P. motor geared direct.
Molding Machines:
1—Battenfeld stationary 17" x 22" platen—jolt-squeeze.
2—Type F International 26" x 36" platen, air jolt-roll over, eight inch draw stationary molding machine.
1—Tabor plain jolt table No. B-18—54" x 96".
1—Arcade—portable squeeze.
Compressors:
1—Chicago 7½" x 6" 106' capacity, 100 lbs.
1—Chicago 12" x 8" 240' cap., 70 lbs.
1—Worthington Feather Valve 150' cap., 100 lbs.
1—Chicago—8" x 8"—Horizontal, 128'.
1—Chicago—6" x 6"—50' cap.
1—Worthington 2 stage 450' cap.
Curtis & Gardner 4¼" x 4½" Vertical 19', many smaller.
Tested-air receivers—12" up to 36" dia.

CLIFTON MACHINERY CO.
1023 W. 6TH, CINCINNATI 3, OHIO

FOR SALE

1—Elwell-Parker furnace charger, type LF tructor, 6000 lb. capacity.

1—Elwell-Parker furnace charger, type LF tructor, 4000 lb. capacity.

1—Crescent electric lift truck, platform size 26 x 55 x 11.

1—Link Belt electric hoist, 1000 lb. capacity, 25 ft. lift, 220—3 ph. 60 cy.

500 ft. American Monorail including switches.

INDUSTRIAL TRADING CO.
942 W. LAKE ST. CHICAGO 7, ILL.

REBUILT

BLOWERS—FANS—EXHAUSTERS
Roots-Connersville positive cupola blowers. Centrifugal blowers for gas and oil burning. Sand blast, grinder end dust exhausters. Ventilating fans.

GENERAL BLOWER COMPANY

406 N. Peoria St. Chicago, Ill.

FOR SALE

1—Used Single phase Electric Steel Furnace complete with transformers, 12,000 volt primary. Automatic Electrode Control, etc. Purchased new May 1942. Has been producing 7 tons daily. Can make shipment within 3 days. Price F.O.B. shipping point $5500. Address: Box 161, The FOUNDRY, Cleveland.

REBUILT USED EQUIPMENT

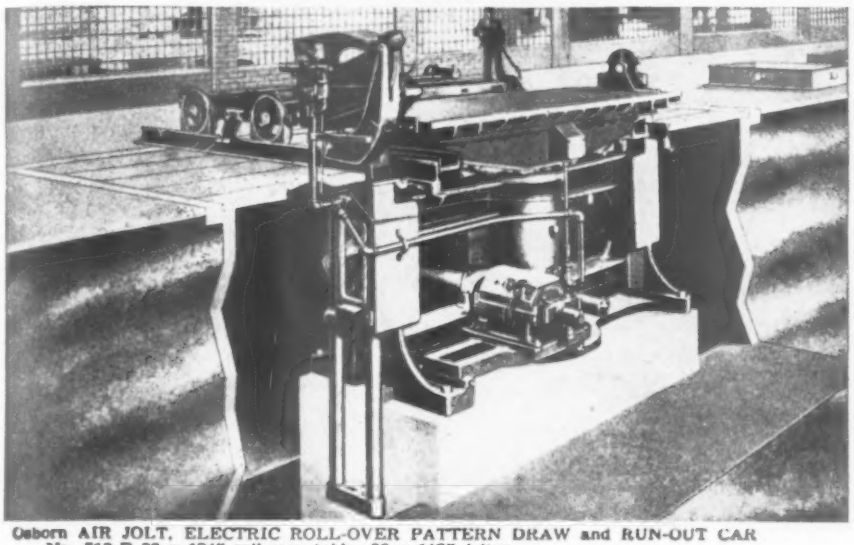
Molding machines, all types; tumbling mills; furnaces; cupolas; air compressors; hoists; rammers, all types; ladles, all types; sand mixers; sand blast tanks; core machines, etc. All equipment rebuilt and guaranteed. All sizes used steel flasks.

HAYNES FOUNDRY EQUIPMENT COMPANY
1734 Lake St. Kalamazoo, Mich.

SCULLY Reconditioned Foundry Equipment

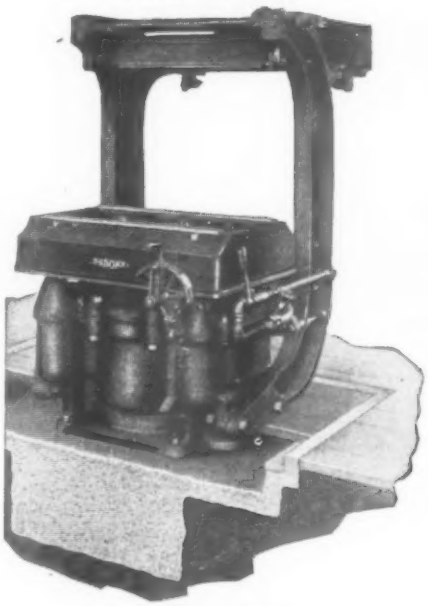
★ ALL SCULLY EQUIPMENT IS REBUILT AND OVERHAULED IN OUR OWN, NEW MACHINE SHOP

OSBORN MOLDING MACHINE



Osborn AIR JOLT, ELECTRIC ROLL-OVER PATTERN DRAW and RUN-OUT CAR
No. 513-E 36 x 124" roll-over table, 36 x 112" jolter.

OSBORN JOLT SQUEEZE & POWER STRIP



No. 703 OSBORN
(Similar to above excepting with roll-off)

No. 703-6 Osborn jolt squeeze and strip, 21 x 28" table, stationary. Length of opening in lifting frame 34", 6" pattern draw, 8" cyl. dia. 1000 lbs. jolting cap. @ 80 lbs. press. Distance from lifting frame to squeeze head 24¼", flask length 44¼" with roll-off conveyor.

No. 703-5 Osborn, same as above, excepting 17 x 35" table.

PANGBORN "GJ" ROTOBLAST complete with Loader and Motors—max. cap. 16 cu. ft.—drum inside 40 x 48".

MISC. MOLDING MACHINES

No. 112 Arcade portable jolt roll-over and squeeze, pattern draw, table accommodates pattern plates up to 13 x 33"—9" draw, distance between uprights 36".

No. 330 Arcade portable jolt roll-over and squeeze, table accommodates pattern plates up to 17 x 34"—10" draw, distance between uprights 44".

28-30" Tabor, 28 x 40" roll-over plate, 12" draw, 1000 lbs. cap. @ 80 lbs.

No. 815 Johnston & Jennings, 30 x 40" roll-over table, 1200 lbs. cap. @ 80 lbs. pressure, 15" pattern draw.

No. 602 Osborn jolt roll-over draw, portable, 24 x 30" flask cap., 900 lbs. cap. @ 80 lbs. press., 10" draw.

No. 22 Davenport, jolt roll-over draw, 20 x 30" table, 750 lbs. cap. @ 80 lbs. press., 10" draw.

HERMAN Independent Turn-Over and Pattern Drawing Device, complete with Automatic Air Clamps and Electric Jolt Timer—

26 x 42" roll-over, 24 x 42" bumper.
24 x 30" roll-over, 22 x 30" bumper.

JOLT SQUEEZERS

No. 76 Arcade straddle portable type with swing-head, 17 x 20" table, 10" dia. cyl.

PLAIN JARRING MACHINES

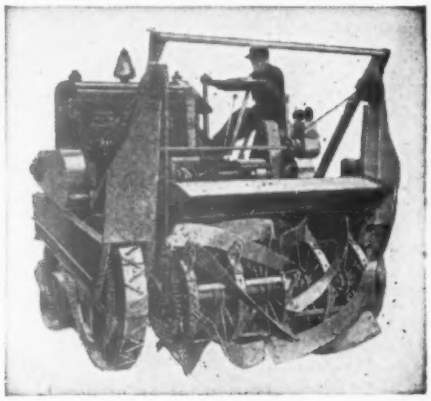
36 x 48" Tabor, 10" dia. cyl., 4500 lbs. cap. @ 80 lbs. press.
42 x 60" Tabor, 13" dia. cyl., 7500 lbs. cap. @ 80 lbs. press.

Pangborn 6 ft. dia. TYPE EH-1 CABINET TABLE INSTALLATION, 5 ft. high partition, Abrasive Handling and Reclamation System, Belt and Bucket Type Elevator, Sandblast Pressure Tank.

AMERICAN SANDCUTTERS

Cleveland-American (similar to Model "K") 84" spiral cutting cyl., 36" dia., 92" between tractor wheels, 5" face—equipped with Cleveland 3-phase 60 cycle 220V AC Motors, Cable and Take-Up Reel.

Cleveland-American 4-motor Model F-Type 112-92, 80" cutting cyl., 8½ ft. between tractor wheels, 220V AC Motors, Cable and Reel.



American Fdry. Model "K" heavy duty type, size 72, equipped with Buda Type "WTU" 20 HP Gas Engine. 72" between tractor wheels, 6" face, having 60" cutting cyl.

CORE TURN-OVER MACHINES

Pridmore Type "H" 16 x 14"—8" drop, portable rock-over drop.

Pridmore Type "H" 22 x 18"—8" drop, portable, rock-over drop.

HAND STRIPPERS (Stationary—Portable)

14 x 18—6" draw	20 x 24 x 8" draw
20 x 30—8" draw	20 x 36 x 10" draw
22 x 24—8" draw	22 x 28 x 8" draw
24 x 24—6" draw	28 x 36 x 8" draw

JOLT SQUEEZE STRIPPERS

No. 142 Milwaukee, stationary, 1200-lb. cap. @ 80 lbs., 6" draw, table 19 x 35"—open end type.

No. 113 Milwaukee, open end type, portable, 500-lbs. cap. @ 80 lbs., 6" draw, 16 x 35" table.

Osborn No. 82 STRIPPING PLATE JOLT SQUEEZER, 46" between rods, 10" draw, 1200 lbs. jolting cap., 1000 lbs. stripping cap. 24 x 36" table, pin lifts 12" part one way, 36" the other.

Nicholls Type "D" stationary heavy duty JOLT SQUEEZE & PATTERN DRAW, squeeze piston 14" jolt piston 6", draw 2-6"—distance between strain rods 40" take approx. 15 x 24" flask.

MAGNETIC SCREEN SEPARATOR

Magnetic Mfg. Co. size 30" dia. x 80" long drum SCREEN MAGNETIC SEPARATOR 115 V 4.5 Amps. Type F-3, complete with shunt wound 3 HP DC 1700 RPM Motor, elevator 10'4" O/A height, 18" width, 22" depth.

No. 8 DEMMLER CORE BLOWER, open throat frame—stationary sand magazine—12" dia. opening at top, 17" core box clamping cyl.—with 12" max. draw—cyl. hydraulically controlled—with aux. exhaust valve.

SCULLY MACHINERY & EQUIPMENT CORP.

(Formerly – Foundry Division of Scully-Jones & Co.)

2031 WEST 74th STREET (Phone PROspect 8770) CHICAGO 36, ILLINOIS

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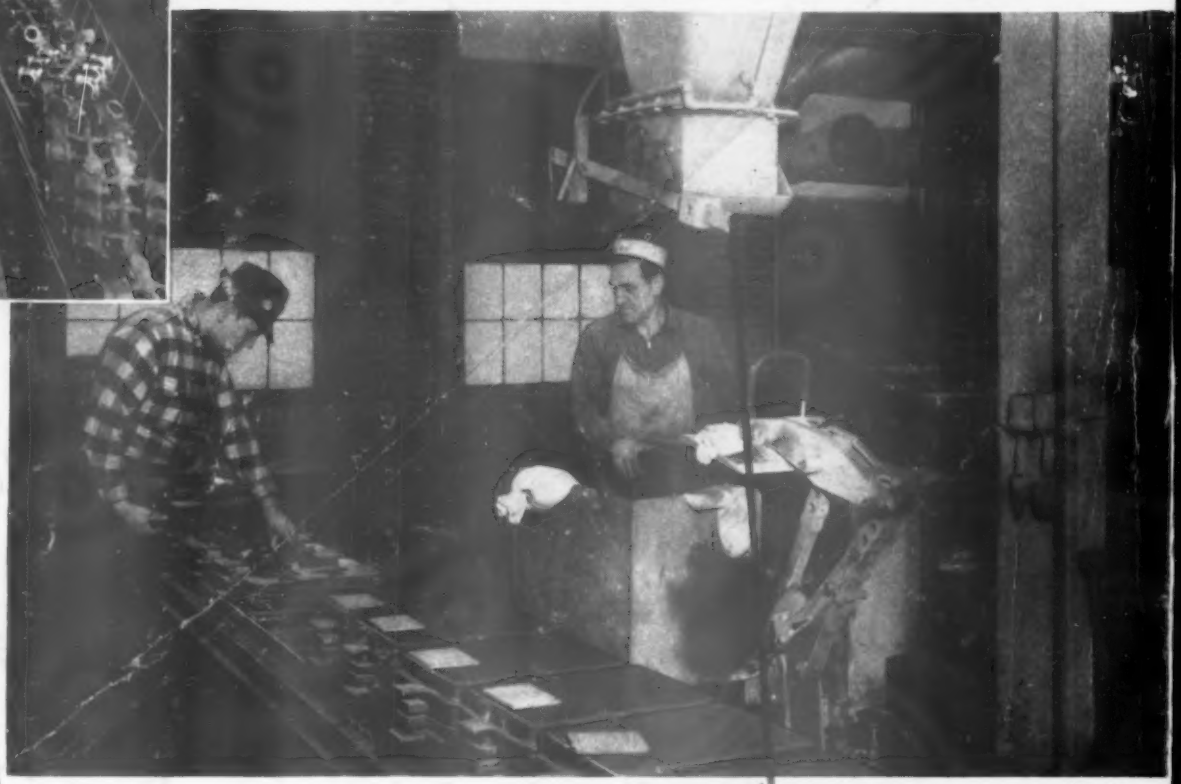
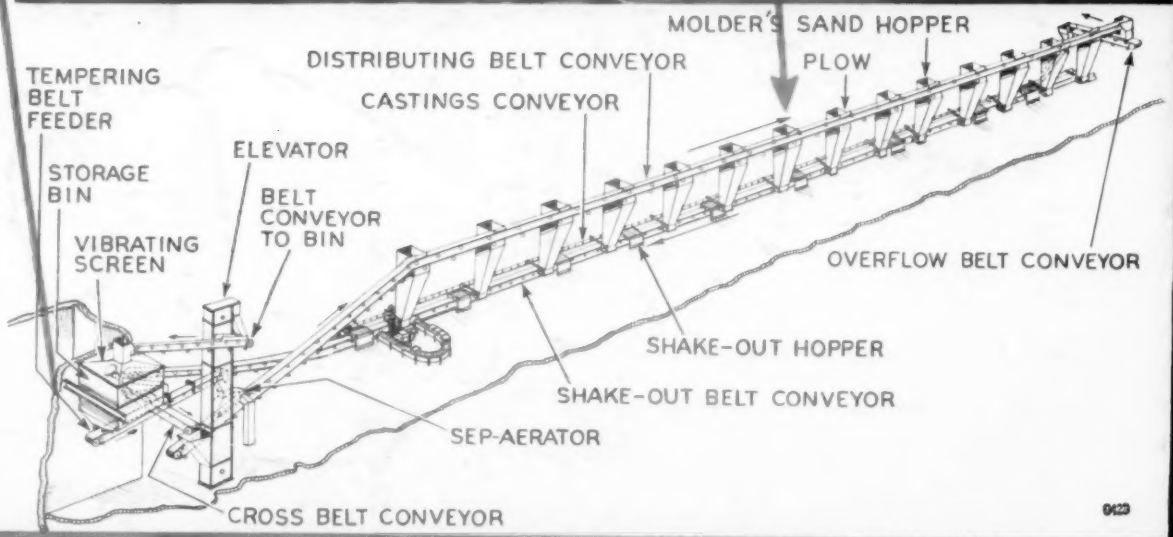


ve: One shakeout st n es two molders. Due to e imity of the shakeout to e der, each man's flasks a d ds are released and stacked kly, without extra handlin . short time between pouri shakeout keeps down th erature of the sand whic ns considerable moisture.

t: Each molding machine cated within the legs of a shaped section of roller con- or. Since the neighboring r conveyor is close by, pour- is easily accomplished be- en the straight runs of each

stings are seperated at h shakeout station and veyed in the opposite ection to that of the d, to the cleaning room the floor below. Shake- sand is carried on a belt veyor to a vibrating een having 3/16" open- s, which passes it to an lined cross belt conveyor, m where it is elevated to other belt conveyor to rage bin. The sand is drawn from this bin by lt feeder. A Sep-Aerator s the sand and removes e additional refuse after ich the distributing belt veyor carries it to the erhead molder's hoppers.



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LINK-BELT CONVEYORS

AND PREPARATION MACHINERY

EVERYTHING FOR A FOUNDRY

Applying Stevens Core Paste to Core Section Preparatory to Assembly.

PHOTO FROM WILSOW FOUNDRY CO. PONTIAC, MICH.

Stevens CORE PASTE

Gives Higher Tensile Strength To Pasted Joints Than Most Pastes With Dextrine Added!

Stevens No. 3 Core Paste

- ★ Mixes easily with water—absorbing more than the average amount.
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- ★ Develops maximum strength very rapidly.
- ★ Will not swell nor boil on drying.
- ★ Has high green and bond strength.
- ★ Does not "gum up" the user's hands.
- ★ When applied to one-half of the joint it adheres firmly to the other half immediately upon pressing together.

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- ★ Especially adapted for pasting cores that are to be set in the mold several hours before pouring—cores will not weaken nor slip.
- ★ Highly refractory—will withstand 3100° F.
- ★ Ideal for jig pasting.

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- ★ Red in color, it is easy to see on cores. Very adhesive and quick acting. Satisfactorily used in many foundries for years.

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